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THE BEST METHOD OF TEACHING OBSTETRICS AND AIDS IN OBSTETRIC TEACHING

BY

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WITH NUMEROUS ILLUSTRATIONS

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THE BEST METHOD OF TEACHING OBSTETRICS.*

It is a little more than seven years ago that our honored fellow, Dr. Theophilus Parvin, at the thirteenth annual meeting of this academy, made, as the majority of us will recollect, a most earnest plea for practical obstetrics in the courses of instruction given by our medical colleges. It was then clearly shown by him that while the science of obstetrics was admirably taught in many of our American medical schools, the art of midwifery was and had been sadly neglected; that the vast majority of American medical students graduated each year without ever having witnessed, still less having had charge of, a case of labor; that in many medical schools not even the practical diagnosis of pregnancy by palpation and auscultation was taught.

The truth of these statements has never been questioned. Up to that time it had been customary in this country for most medical students to graduate either without any practical knowledge of midwifery, or with such only as they were able to obtain by witnessing an occasional case in a clinic, or possibly by treating women in confinement in their own homes without the supervision or aid of an instructor.

The result was inevitable. The art of obstetrics was learned by the young practitioner often at the expense of serious if not fatal injury to his first confinement cases. During the past decade a revolution has been in progress in the teaching of medicine in this country. The two- and three-year courses are gradually but surely being replaced by four years of instruction; college terms of five, six, or seven months are being lengthened to eight and even nine.

The haphazard theoretical or didactic teaching of the old two-year course has already been largely supplanted by systematic recitations and practical and thorough laboratory instruction. The clinical instruction to large audiences of former years is generally supplemented by practical clinical work performed by small sections of the class. In many medical colleges it is undoubtedly still customary to cling to the old form of lecture delivered to large audiences. It is, however, gradually but surely being replaced by systematic graded courses of practical and clinical instruction.

Has the subject of obstetrics, usually classed as the last of the seven fundamental divisions of medicine, kept pace with the remaining six in this reform? To a certain extent, yes. As to the question whether it has advanced with the same rapidity as the others, we are compelled to answer in the negative.

The history of medical progress in the past few years certainly points to some reform in the teaching of the art of midwifery, shown in marked improvements in the matter of instruction in colleges already possessing lying-in departments, and in the establishment of new institutions whose main purpose is the imparting of practical instruction, not only to the undergraduate student, but to the graduate physician as well.

Ten years ago not a single medical school in New York city, for instance, required its students even to witness cases of confinement before graduating. At that time there were nine institution in New York either wholly devoted to lying-in patients, or with lying-in departments attached, and in none of these was systematic instruction in obstetrics given. To-day six medical schools require that each student before graduation shall have attended at least six cases of confinement, and there are some thirteen institutions devoted wholly or in part to obstetrics, five of these giving systematic instruction to students in midwifery.

In spite of these facts, there appears to be no doubt that the teaching of obstetrics generally, throughout the country, is at this time anything but what it should be, and that "clinical instruction is largely conspicuous by its absence."

"The number of great maternity hospitals in this country in which students can receive practical training can be numbered on the fingers of one hand. As a country we are far behind in this matter." †

The best method to teach midwifery can not be described under any single method, but must, of necessity, be a combined method—a system—a combination of recitations, demonstrations, manikin practice, attendance upon clinics, practical bedside or hospital work, and theoretical lectures, the teaching of the science and art of obstetrics. The classified knowledge of the laws which govern menstruation, ovulation, pregnancy, labor, the puerperium, and obstetric surgery on the one hand, and the intelligent appreciation and practical application of the acquired classified knowledge at the bedside on the other.

Although history tells us obstetric science has had a tardy development, that not until the sixteenth or seventeenth century was it fully established, still, from an educational standpoint, the science has far outstripped the art in the race. May the time soon come—and the indications point to its being not far away—when both shall be equally well taught.

The natural and, as experience teaches us, the best sequence for the student to follow is for him to acquire a working knowledge of the science of obstetrics before he applies himself to the art. This he does in his recitations,

* Read before the American Academy of Medicine, Atlanta, May 4, 1896.

† Mann. President's Address. *Transactions of the American Gynæcological Society*, No. 20, 1895.

clinics, and demonstrations. Further, we believe it advisable to defer the taking up of the general subject of obstetrics until the pupil has had at least one year's instruction in the medical school, especially in physiology and anatomy. Without this preliminary study the student can not profitably or comfortably digest instruction in the elements of the physiology and pathology

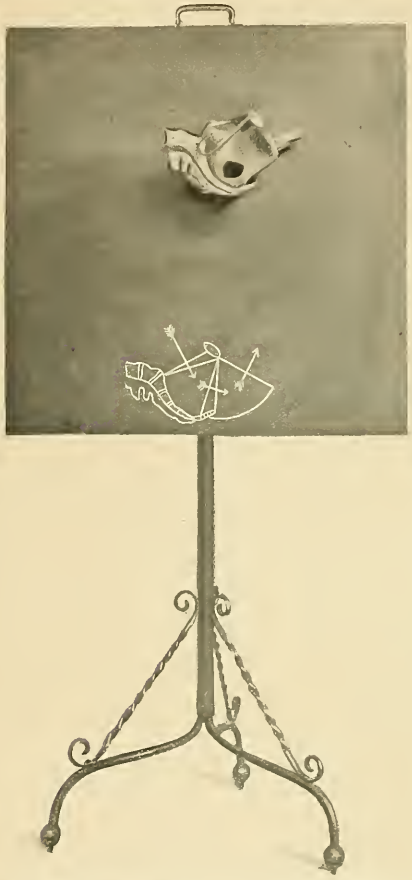


FIG. 1.—Vertical mesial section of the bony pelvis cast in aluminum and mounted by means of a hand screw upon a blackboard and tripod. The bodies of the lumbar, sacral, and coccygeal vertebræ are outlined and numbered. The hand screw permits the cast being set at any angle. An outline of the bony pelvis showing the axis of the pelvic inlet and those of the bony and parturient outlets is permanently sketched upon the blackboard below. (From a photograph.)

of the puerperium, delivery, and pregnancy. He must be familiar with the characters of the various tissues of the hard and soft parts concerned, to which constant reference is made in his recitation year, in terms of microscopic and histological anatomy.

Whatever may be the place of topographical anatomy in courses of anatomy *per se*, its consideration should come early, at the very beginning, in a course of obstetric teaching. It is in a high degree necessary that the pupil shall have mastered, by the time he enters upon his obstetric training, not only the size, shape, and consistency of the normal lower abdominal and pelvic organs, but the relations in space which such organs as the labia, clitoris, meatus urinarius, and hymen, together with their glands, blood-vessels and nerves; the uterus and vagina, kidneys, ureters, bladder, and urethra; the sigmoid flexure, rectum, and anus; abdominal aorta, ovarian, external and internal iliac, and uterine arteries; ovaries, Falloppian tubes, and ligaments of the uterus; pelvic muscles, peritonæum, glandular, vascular, and nerve supply, sustain to one another. If in addition the student has mastered the elements of histology, then, and only then, can he be considered fully equipped to receive elementary instruction from the department of obstetrics, and the head of this department is then free, as he should be, to direct his whole energies to the work which he has been appointed to undertake. After this, the pupil's work in obstetrics should be so systematized as to blend progressively with the work of his remaining three years in the medical school, and render him at the end of that time not only capable of answering the few simple questions found to-day upon the final or State examination paper, but fully competent as well to care intelligently for women in normal labor, and at least to recognize, if not meet, the ordinary complications of the lying-in state, labor, and pregnancy.

Experience has taught us that this end is most surely and thoroughly attained by pursuing some such plan as the following, in the sequence named:

I. Systematic biweekly or triweekly recitations during the second college year.

II. (1) Demonstrations and manikin work; (2) attendance upon obstetric clinics; and (3) laboratory work during the third collegiate year.

III. A resident service in a maternity hospital, which shall include (1) the examination of pregnancy under competent instructors; the actual confinement of patients by the student himself, under rigid supervision in both; (2) "ward" or indoor service, and (3) "outdoor" or polyclinic service; (4) the attendance upon the obstetric clinics of the hospital; (5) theoretical lectures (illustrative in character); and (6) recitations subsequently upon the previous practical work performed by the student.

IV. Theoretical lectures (illustrative in character) upon advanced obstetrics.

I. Systematic Biweekly or Triweekly Recitations during the Second College Year.

Attention has been called to the unfortunate custom still prevalent in many medical colleges throughout this country to teach obstetrics to large audiences by means

of the didactic or theoretical lecture. Within a few years the attempt has been made by certain institutions to

Fig. 2.—Pelvis and blackboard of Fig. 1 used to demonstrate forceps applied to fœtal head at the pelvic inlet and dangers that result from the faulty position of the handles and traction in this wrong direction. (From a photograph.)

supplant this lecture course wholly or in part by the recitation. Since the introduction of this latter method of teaching the shortcomings and faults of the old didactic lecture, still generally in use, have become more than ever apparent. Moreover, the contrast of the two systems has resulted in benefit in quite another way, since it has markedly changed the character and tone of the theoretical lectures which still exist as supplements to the recitational and practical work, raising them to a higher plane, giving them a more practical and illustrative form, and thus making them in every way more helpful to the student.

Although the advantages of the recitation system are more perceptible each year in the better qualified graduating classes, still, we believe the recitation, so far as obstetrics is concerned, can be made of still greater value and interest to the student, even though the instructors be comparatively young men.

It is not sufficient that the section of twenty or thirty pupils be required to learn and recite in a perfunctory manner the principles and laws of obstetric science as set forth in some good text-book in biweekly or triweekly recitations, but these principles and laws must be brought home and rendered real and interesting to him by abundant illustration.

Perhaps in no other branch of medicine is this object so readily attained as in obstetrics, since the underlying principles of the subject for the most part rest upon the well-known laws of anatomy, physiology, and physics, all of which permit a wide range of illustration.

No department of obstetrics is to-day complete without such means of illustration, and it should be the instructor's duty to make such intelligent use of them as to supplement the labors of the head of the department, relieve him of much of the theoretical work, and, at the same time, better prepare the student for an intelligent appreciation of his subsequent demonstration work, attendance upon obstetric clinics, and finally for his residence in the maternity hospital.

The instructor will do well if, at the beginning of the session, he lays out a schedule for his entire course, gauging his hours of recitation so as to cover the entire field of the subject in the teaching year.

There should be plenty of blackboard space at his command—pelves entire, sagittal and transverse sections of the same, diagrams and charts, carefully selected models, wet and dry preparations, and the more common obstetric instruments.

With a little ingenuity and forethought each individual member of a section of say twenty students may be tested regarding his appreciation of the subject in hand during the recitation hour.

This is readily accomplished by assigning a portion

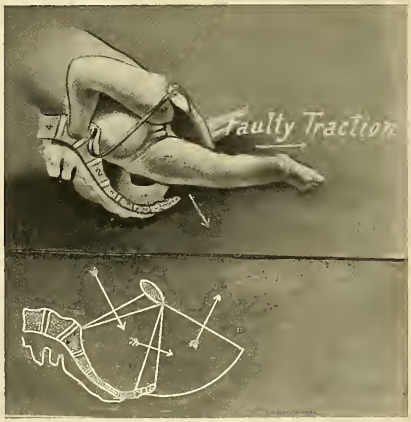


Fig. 3.—Pelvis and blackboard of Fig. 1, showing breech presentation with left buttock caught at the pelvic inlet and the dangers of faulty traction on the prolapsed leg in a horizontal plane. (From a photograph.)

of the section to the blackboard, to execute there a diagram, enumerate a series of principles, or write definitions, which are subsequently criticised by the instructor. Another squad is assigned to a number of wet and dry specimens conveniently placed on trays, which the student, after a time given to look them over, is called upon to demonstrate.

Among the wet specimens of especial use at this time are placentæ with membranes and cord attached and preserved in alcohol or formalin; ova of the first few months to demonstrate the transition from chorion to placenta, the amnion, the umbilical vesicle, and so on; a uterus showing the decidua of menstruation, another the decidua of pregnancy; also a collection of preserved embryos and fœtuses, all of which the student shall be required to inspect or measure, and describe not only the gross appearances and characteristics, but also the chronology of each. Any or all of these specimens the pathologist of a maternity or large general hospital may readily secure.

The dry preparations may include mounted placentæ, injected through the vessels of the cords with different colored material or corrosive preparations of the same. These may comprise the normal conditions of the vessels and departures therefrom.

Fig. 4.—Pelvis and blackboard of Fig. 1 used to demonstrate sling applied to the breech and faulty direction of traction thereon. Position of double sling for breech extraction also illustrated. (From a photograph.)

Still another squad is in the same way assigned to carefully selected models, and the remainder of the class is then questioned upon the subject of the day, enough of the latter part of the hour being reserved for demonstrations and criticisms of those assigned to the blackboard, specimens, and models. Such a plan is by no means difficult to carry out, as experience will prove.

Regarding the models, there is practically no limit to their number, as we show in another place (demonstrations and manikin work), but perhaps the most useful of them all at this time will be found a sagittal section of the pelvis, cast in aluminum, and so mounted upon a portable blackboard as to allow of being fixed in the proper planes of both dorsal and upright positions.

Nothing has been of greater aid to us than this contrivance, since, with chalk, pelvic planes, angles, curves of bony pelvis, and parturient canal may be clearly demonstrated.

We can not too strongly urge the importance and the benefit to the student of actually handling the wet and dry preparations, pelves in whole or in part, models, and instruments used in the recitation.

To illustrate the foregoing, take the subject of pelvic deformity, for example. Five students are assigned to manikins with the sacral promontories set to give true conjugates from three inches and three quarters to two inches and a half. A pelvimeter is at hand, and the students are asked to state, after examining the diagonal and true conjugates, the difference between these, the factors influencing this difference, the effect on labor of the contracted pelvis, and the necessity for interference.

Among another squad of five pupils are distributed five copper-plated models of moderate pelvic deformity, and by means of a pelvimeter the students are requested to find the more important diameters, and finally to state the probable cause of deformity, and the effect upon labor of the same.

Still another squad of five pupils is assigned blackboard space, one to enumerate the principal pelvic diameters and their usual lengths, another to demonstrate the three conjugates of the pelvic brim, another the more common kinds of pelvic deformity, another the causes, and still another the methods of delivery.

The remainder of the section can now be quizzed upon some special branch of the subject—for example, the relation between pelvic contraction and malpresentation, position, and attitude, as illustrated by means of models in sagittal and transverse sections; and, lastly, the work of each individual student is inspected, and if necessary criticised, the whole section being appealed to for opinions on difficult points.

II. (1) Demonstrations and Manikin Work; (2) Attendance upon Obstetric Clinics; (3) and Laboratory Work during the Third Collegiate Year.

Not even at this time in the student's course is it practical or advisable to attempt to handle classes that exceed thirty.

It is desirable that the position of instructor in obstetrics take on more the nature of a demonstration of obstetrics; that his department consist of a combined museum, manikin, and recitation room, furnished with a generous supply of manikins, models, embryological, anatomical, and pathological wet and dry specimens, charts, diagrams—in short, all the recognized aids to obstetric teaching.

In such an obstetrical laboratory the recitations and demonstrations should be conducted to small sections of the class as above described.

1. *Demonstrations and Manikin Work.*

So far as the demonstrations and manikin work go, biweekly or triweekly meetings, for a period of six to eight weeks, will pretty thoroughly cover the ground.

It is well for the instructor to aim in this section work not only at a systematic course in manikin work, but also at the same time a review of the theoretical work gone over in the second year, giving it, so far as possible, a practical application. This, with a little attention, can be readily accomplished.

The models may be of plaster, or *papier-maché* reproductions of plaster and clay, copper-plated models, or composition, or of a miscellaneous character. With them the parturient canal with its curves; the mechanism of cervical dilatation in primiparæ and multiparæ; the size and shape of the uterus at the several months of gestation; the degrees of uterine, vaginal, and perineal ruptures, and methods of the repair of the latter; involution of the puerperal uterus, as shown in a series of *papier-maché* reproductions of frozen sections; the various forms of pelvic deformity; the action and use of various cervi-

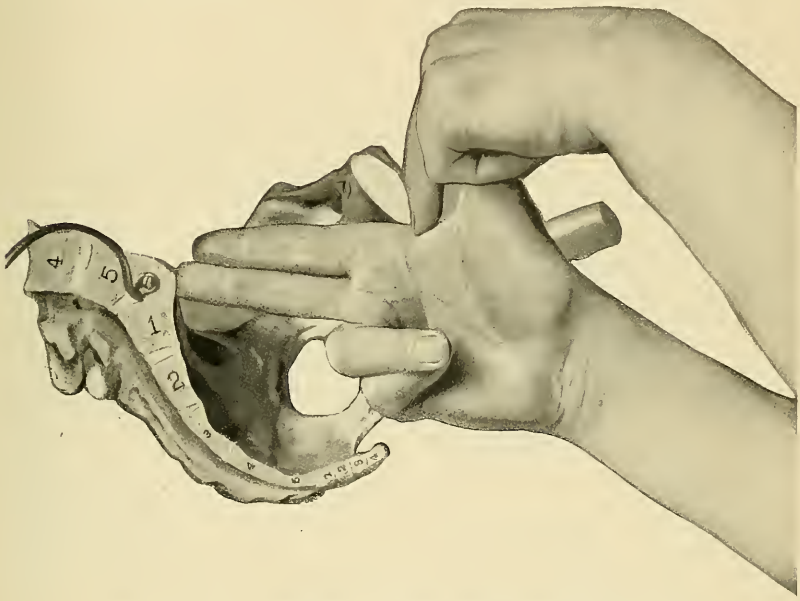


Fig. 5.—Pelvis of Fig. 1. Manual method of measuring the diagonal conjugate. (From a photograph.)

Here again, with a little ingenuity, most, if not all, of the section or squad may be assigned some task to perform during a given hour, so that the student shall take as active a part as possible, leaving little of his time without some occupation.

Such demonstrations and manikin work will call for more apparatus, models, and specimens than was required in the recitations of the preceding year. An abundance of blackboard space is required as before; pelves entire, and in sagittal and transverse sections, must be constantly at hand; three or four good manikins, with a supply of puppets, fœtal cadavers (preserved in formalin or alcohol), embryos, fœtuses, placentæ, with their membranes in different stages of development, and carefully selected models for use alone and in conjunction with the manikins.

cal dilators; the intra-uterine tamponade; the puerperal curette; the ligature in cervical hæmorrhage; manual dilatation of the os, and many other obstetric conditions. (See Aids in Obstetric Teaching, to be published in a subsequent number.) We must insist, however, upon the recognition of the proper place of these models in obstetric teaching, and sound a caution regarding their use. They should be viewed as auxiliaries, as adjuncts, and as a better preparation for subsequent practical instruction; and care must be used that no false or exaggerated impression is conveyed to the student in their use. In another paper we shall describe in detail the manner of their production. As in the recitation system, the same general plan of assigning work may be employed, the student, however, being required to take a more active part.

Thus, by a general illustration and a demonstration form of instruction, much that heretofore has been more or less problematical may be cleared up, and new interest may be given to many obstetric subjects which, by reason of their obscureness and "dryness," proved stumbling blocks to the student, and later to the practising physician.

This is the time and opportunity given the student to acquire that manual training in obstetric procedures which may never recur until he is in active practice, and he should be made to appreciate his advantages.

It is at this time that he acquires the kind of training which gives to the intending physician the practice to make him intelligent and expert in the use of his knowledge; the kind of training which saves the newly appointed hospital interne the mortification, in the presence of his seniors, of applying the forceps upside down; the kind of training which causes the interne or newly appointed instructor ever to remember that there is such a thing as a curve to the parturient canal, and that traction with the forceps applied to the brim or on a leg in high arrest of the breech, in a horizontal plane, quite possibly result in disaster to mother and child! For close observation will show that improper and faulty traction with the forceps has cost the lives of more mothers and children than almost any other obstetric operation, in proportion to its frequency. To impress this fact upon the pupil's mind, he must be made to *see* in what the danger lies. By means of such training the physician's first cases of confinement will be saved much that otherwise would be experimental and crude in the manner of treatment.

Take, for example, the subject of post-partum hæmorrhage. Eight or ten students are assigned to manikins, in which are placed leather models of the puerperal uterus. Gauze, volsella, dressing, and needle forceps, needles and ligatures, and specula, all of which are part of the equipment of the department, are at hand.

Each student, with the assistance of a second, and under the supervision of the instructor, is required to pack the uterus with gauze (Fig. 7) and also place a ligature in the apex of the laceration in the neck of the model (Fig. 8). The models are then removed from the manikin, and the manner of gauze packing and the position of the ligature demonstrated and criticised by the instructor. Copper-plated plaster casts of the several degrees of vaginal and perineal lacerations are distributed to other pupils for inspection and subsequent demonstration. Other students are assigned blackboard space to enumerate origin of hæmorrhage after delivery, mechanism and causes, and principles of treatment.

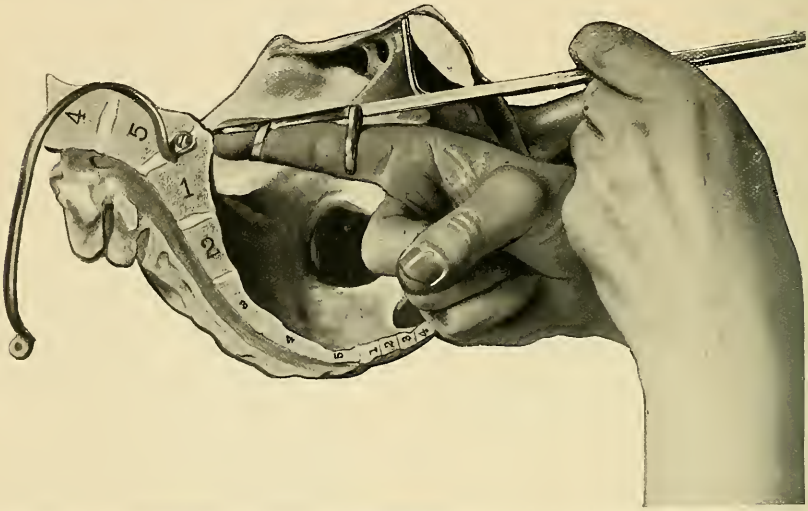


FIG. 6.—Pelvis of Fig. 1. Instrumental method of measuring the obstetrical conjugate directly by means of Farabœuf's pelvimeter. (From a photograph.)

Such a course can not be considered complete without an occasional demonstration of the diagnosis of pregnancy upon the living subject. Cases of pregnancy may for this purpose be sent in from the dispensary of the institution or from a maternity hospital.

These demonstrations can be made a valuable preliminary to the resident hospital course to follow later. Information obtained by inspection, palpation, and auscultation can be interestingly dwelt upon by the instructor, and appreciated by the student.

2. *Attendance upon Obstetric Clinics.*

An occasional attendance at an obstetric clinic during this third year will be of the greatest assistance in fixing

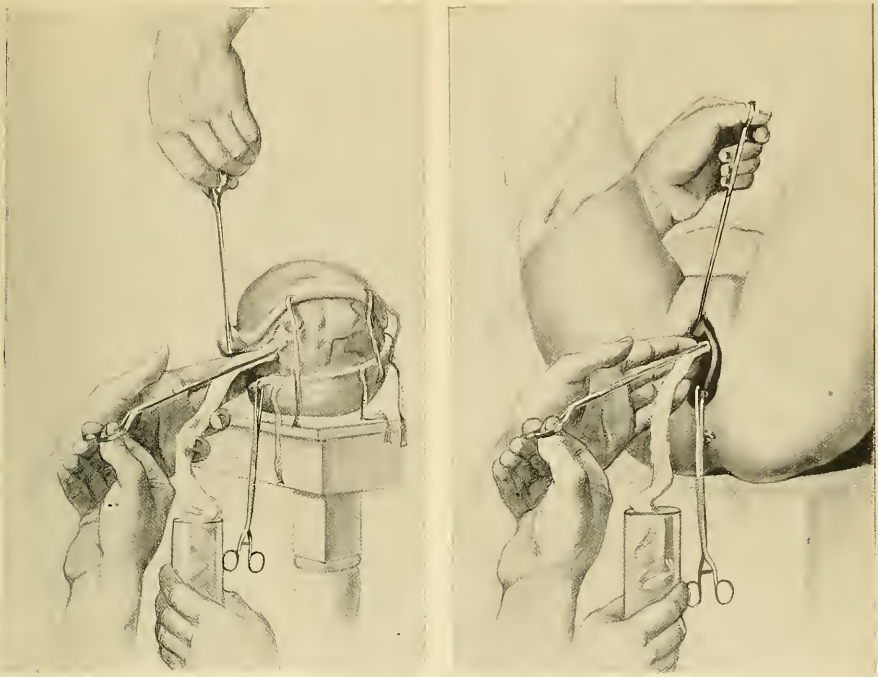


FIG. 7.—Leather model of puerperal uterus placed in manikin, and used to demonstrate packing of the puerperal uterus with gauze to control post-partum hæmorrhage proper, or to secure drainage in atonic or septic conditions of the uterus.

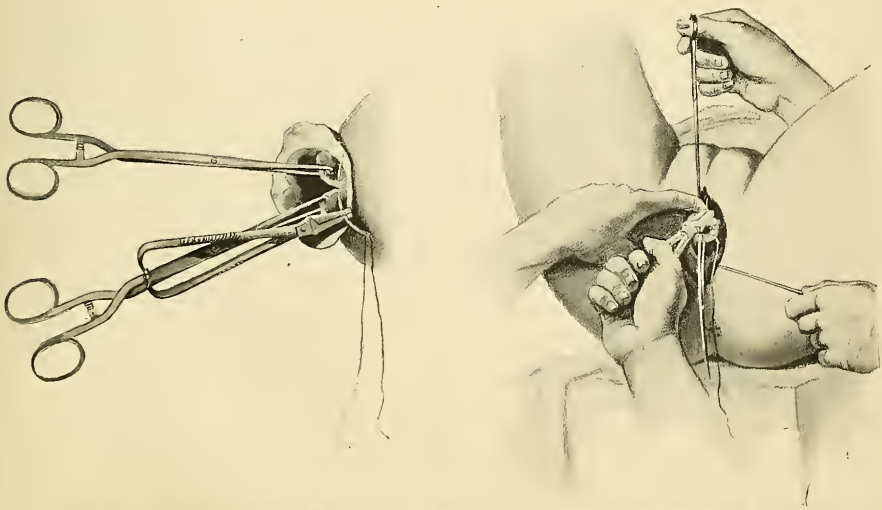


FIG. 8.—Leather model of puerperal uterus placed in manikin, and used to demonstrate treatment of post-partum hæmorrhage due to a deeply lacerated cervix.

the theoretical work of the second year, and the demonstrations and manikin work the student takes part in at this time.

If possible, his time should be so laid out as to permit the student to attend over a stated period the obstetric clinics of the hospital, or until he has watched the delivery of several cases of confinement. If it can be arranged for him to take at this time his practice in the out-patient department of the hospital, in the examination and diagnosis of pregnancy, so much the better, for the student can then learn the preliminary principles of cleanliness, thus anticipating his resident service in the maternity.

3. Laboratory Work.

Provision should be made for those students who desire special opportunities to study histology, pathology, bacteriology, and embryology, that would not be obtained in the regular courses of the colleges they attend. Little time will be left for such work after the regular laboratory courses in histology, pathology, and bacteriology, consequently advanced research on the part of the student is best undertaken during the vacation intervals or after graduation.

III. A Resident Service in a Maternity Hospital, which shall include (1) the Examination of Pregnancy under Competent Instructors; the Actual Delivery of Patients by the Student Himself, under Rigid Supervision, in both. (2) "Ward" or Indoor Service. (3) "Outdoor or Polyclinic Service. (4) The Attendance upon the Obstetric Clinics of the Hospital. Also (5) Theoretical Lectures (illustrative in character), and (6) Recitations Subsequently upon the Previous Practical Work performed by the Student.

Resident Maternity Service.

Without entering into the controversy regarding the actual amount of participation on the part of the student in the practical work of the hospital or of the polyclinic or "outdoor" service, we believe that such obstetric courses should to-day demand not only that the student shall witness the delivery of the patients, but also that he shall personally actually confine the patients, always in the presence of an expert and critical instructor. Moreover, the subsequent care of the puerperal woman and newborn child should rest with the student, always again under a complete system of checks against accident and under the most rigid supervision. That this is not only practical but possible can be abundantly shown by records of thousands of cases of confinement thus managed without accident.

It has been charged against this practical system of teaching, as applied to the medical student, that it carries with it a high mortality rate, and that the patients treated under such a system are subject to unnecessary exposure.

The first objection is abundantly answered by the records of many such practical systems established years ago in Germany, and by those of several established within the past decade in this country.

The latter objection can only hold good by reason of a lapse in the rigid, critical, and constant supervision on the part of the instructors, which must at all times pervade such practical systems of instruction.

The student will best appreciate and profit by this course if it is taken during his third year, or, better, in vacation time, between his third and fourth years, when he has full leisure to give to it. He should be brought to look upon this practical course as the most valuable and important of his whole obstetrical teaching, for all that he has previously learned is to be tested and fixed in his mind; theoretical deductions are to give place to practical application; he will now not only observe his classified knowledge applied at the bedside, but use and apply it himself.

There is no doubt that students, as a rule, fully appreciate the advantages of such clinical work, although it demands extra time and much work. It is no uncommon occurrence, in one institution at least devoted to education in practical obstetrics, for the student to ask the privilege to remain over his regular period of service, or even to return after a lapse of several months and repeat his practical obstetric course, although he has already more than fulfilled the requirements for graduation.

1. The Examination of Pregnancy. 2. The "Ward" Service.

It is advisable that the first of the student's observations should be in the examination of pregnancy. The first few days of his service should be rather passive ones. He should be called to witness all the deliveries and operations in the wards or operating room; he should attend such clinical lectures as shall be given; accompany the attending or resident physician in his diurnal rounds, and in addition should spend several hours each day in the out-patient examining room or waiting ward, where, under a competent instructor, he should be required to take an active part in the examination and diagnosis of pregnancy, including pelvimetry, and should, under the supervision of the instructor, be required to fill in properly and sign his name to the histories of pregnancy. It will be well if the record charts used at this time—and later for confinement cases and the newborn child—be fuller and more detailed in their requirements than perhaps the medical records of a hospital would demand. This is intended to bring out the student's faculties of observation, and a wider consideration of the subject than is generally considered necessary. Examinations thus carried out under the eye of the instructor, with attention to minute details,

as well as general observations in the examination and care of even a few cases of pregnancy, labor, and newborn children, will prove of far greater advantage to the student than a much greater number cared for by him without direct instruction and supervision.

No better time than this can be selected to inculcate in the student the principles of obstetrical cleanliness, mechanical and chemical.

Rules and explicit directions for personal cleanliness and disinfection may be printed to advantage in bold type and hung in the examining room, as is the custom in some foreign maternities, notably of Prague. Moreover, by this plan the same rigid cleansing and disinfecting of the hand and forearm is applied to the examination of pregnancy as to that of labor, and to carry it out properly an abundant supply of fresh water, soap, brushes, and mercuric chloride are called for.

With an abundance of material, such examinations of the dispensary and waiting women of the hospital may, after the student has examined several cases under proper supervision, readily be made to resemble the "touch course" of the foreign maternities.

With two students assigned to a case they may be given time, after cleansing of their hands under supervision and according to the rules of the institution, to examine the women both externally and internally. The instructor in charge then examines the cases and questions the students regarding the general condition of the patient, the time of gestation, posture and presentation of the fœtus, condition of the mammary glands, anterior abdominal walls, external genitals, pelvic contents, size of the bony pelvis, and departures from the normal in hard or soft parts.

He may now, with great precaution, be permitted to examine several cases in labor in the wards or delivery room; then under rigid and expert supervision he may be allowed to care for the entire confinement. The instructor must stand ready at this time to correct errors in cleanliness, and criticise unskillfulness in management.

Under the supervision of the instructor, as in the examination of pregnancy, the student should be directed in the filling out of a complete history of labor and child, going into the minutest details in order to train his faculties of observation, and to this his name should be signed, so that he may understand that he personally is held to account for the future welfare of the case.

Should the student remain on "ward" duty, the future care of the case is assigned to him, still under supervision of the ward instructor, and the daily observations upon mother and child are taken by him and criticised at the diurnal rounds of the attending or resident physician.

3. "*Outdoor*" *or Polyclinic Service.*

The systematic training the student has received in the wards renders it possible for him to put this same training in practice in the care of women in their own homes. Thus, a large class of the poor of great cities, who either can not or will not enter a maternity hospital, may be reached. It is no doubt true, so far as this country is concerned, that while a small proportion of the poor dependent upon charity for proper aid in confinement is cared for in maternity hospitals, by far the greater number remain at home and must be attended there. This outdoor, polyclinic, or tenement-house service on the part of the student can only be rendered practical by an elaborate and carefully supervised system; by the most thorough checks against accident; by an abundant supply of clinical instructors; and by establishing throughout the district to be covered by the service a number of substations to the main hospital building, so situated that one at least shall be easily accessible to each patient on the waiting list, and all in touch with the main hospital by means of telephonic connection.

Here, again, it can be abundantly proved that such a system is not only feasible, but capable of being carried on successfully. Regarding the greater advantage to the student of the outdoor maternity system, as compared with the indoor service, there can be no question. In the former, the pupil, being thrown more upon his own resources and responsibility, becomes no longer a looker-on, an assistant, but, being practically in charge of the case of confinement, he profits by his experience accordingly. The limits of the present paper forbid our enlarging further upon the machinery by means of which such outdoor lying-in services are conducted. Moreover, descriptions of such systems, carried on in Baltimore, Philadelphia, New York, and Boston, have been sufficiently dwelt upon during the past ten years.

4. *Obstetric Clinics.*

With a properly equipped operating room and amphitheatre, each normal or abnormal delivery in the maternity may be made the occasion for an obstetric clinic, all the students on the premises being summoned for the occasion. For this to be properly carried out, it should be demanded of the resident staff that it shall also be a teaching staff, and that a preliminary history of the case, in each instance, should be concisely stated, as well as a careful exposition of each step of the labor or operative procedure.

Such obstetric clinics could readily be made to resemble the diagnosis classes held abroad, as, for instance, in Munich or Prague, where parturient women are rolled into the amphitheatre from the ward or delivery room, and two students are called down from the seats, required to render their hands and forearms obstetrically clean, in the presence and under the criticism of the instructor, then to examine the case, make their diagnosis of pregnancy or labor, presentation, condition of os, membranes, vagina, vulva, bladder, rectum, and hard parts, and finally undergo questioning from the instructor regarding their findings in the case.

Should operation or interference be called for it is to be performed by the instructor; but should the case prove a normal one, the student may be permitted to complete the case, always under the criticism and supervision of the instructor, who should be expected to address not only the students at the case but the entire audience.

Many points of practical interest connected with the management of the second and third stages of labor, the handling of the child, the care of its eyes, the administration of the post-partum douche, the watching of the fundus uteri, the application of an occlusion dressing and abdominal binder, may be brought home in a most thorough as well as interesting manner.

The further conduct of mother and child may rest with the two students confining the case, and they should be held responsible for subsequent departures from the normal condition.

5. *Theoretical Lectures.*

Little time will be left to the pupil for theoretical instruction during his maternity service. This should precede and follow his practical instruction.

What theoretical teaching he does receive at this time should have direct bearing upon the work in hand, and should rather take for its subject abnormal or interesting cases occurring in the recent service of the hospital.

6. *Recitations.*

What we have said regarding lectures applies equally to recitations. One or two a week, however, will prove of the greatest value in fixing the previous practical work of the student. It will be found here that the use of those aids to illustration to which reference has already been made in the college course will prove of untold value in firmly establishing the principles of practical obstetrics in the pupil's mind.

It may be mentioned here that most of these aids, with the exception of the wet and dry specimens, are of such a nature as to be readily kept clean, and thus free from even the suspicion of danger as regards their use in a maternity.

IV. Theoretical or Didactic Lectures (illustrative in character) upon Advanced Obstetrics.

A good deal has recently been written regarding the passing of the theoretical or didactic lecture, and the fact that it is less generally made use of than heretofore has, in the foregoing pages, already been alluded to. I can not but believe, however, that, so far as obstetrics is concerned, the theoretical lecture, in a modified form, still has its place and can accomplish much good.

I do not refer to the old-fashioned lecture of fifty-five minutes, devoted to rehearsing the course of a disease, interspersed with anecdote and clinical experience of the speaker, but we have reference to a lecture—theoretical in part, to be sure, but partly recitation and partly demonstration—which deals with the pathological conditions of more advanced obstetrics, and covers such subjects as abortion and premature labor, extra-uterine gestation, the mechanics and physics of labor, ruptures of the genital tract, puerperal infection, and the rarer forms of pelvic deformity.

Fifteen minutes at the commencement of such a lecture can, to advantage, be given to recitation upon the subject of the preceding lecture, and pathological specimens, models, the blackboard, and the lantern and screen are not to be neglected as means of demonstration and illustration.

In conclusion, I desire to affirm my deep conviction that the subject of obstetrics should be considered in no sense of the term a specialty, but a department of medicine and surgery.

Further, that in the recitations, demonstrations, laboratory work, clinics, practical bedside instruction, and theoretical lectures, already alluded to, the instructor should render a service not only to his listeners but to medicine in general, by rising to something higher than a mere perfunctory performance of his assigned duties, and impress clearly upon his class the fact that midwifery is not a specialty but an integral part, a subdivision only of medicine and surgery.

No part of any subject can be properly understood unless it is studied in its relations to the whole. The interdependence and intimate relationship of these three branches can not be too clearly brought out or too often insisted upon. The light shed by each on the complications of the others is too bright and too valuable to be lost in the obscurity of prejudice and misconception.

Obstetrics to-day, and at all times, should be taught equally as a department of medicine and as a department of surgery.

The day, which fortunately for suffering women has passed, has not faded from the memory of living men—men indeed who took an active part in raising midwifery to its present position, when the obstetrician was refused his equal place by his brother physicians and surgeons, using the words in their narrowest sense, when he was not permitted to operate in the great hospitals of the centres of population, and his art was relegated to the place it occupies now in the hands of the midwife! With the advance of medicine in general during the last half century has come the recognition from every quarter of the kinship of these allied branches, and of the knowledge added to the general fund by the obstetrician's painstaking research. It is just these facts which we claim should be continually brought to the student's attention, in order that he may not in his future career *

* Barnes. Inaugural Address. *Glasgow Medical Journal*, December, 1894.

fall into the error of regarding midwifery as a thing apart from general medicine, and, further, that, if his work should chance to lie more particularly in other fields, he may carry with him a just appreciation of an art in which he has been at least thoroughly drilled.

In illustration of what has been said, it may not be amiss to cite a few instances demonstrating that the physiological and pathological states of pregnancy, the puerperium and labor, the therapeutical and surgical measures adopted in handling them, differ certainly not in kind from these conditions found elsewhere. It is only that the greater skill of the accoucheur after long training gives him an advantage readily recognizable. The toxæmia of pregnancy is toxæmia still in spite of its graver import, perhaps, in the danger to the life of mother and child, and its indications in the way of treatment are the same, save for the additional obstetrical treatment. Transient glycosuria disappearing with the termination of labor or the onset of lactation, jaundice, hæmorrhage, cardiac hypertrophy, thrombosis, embolism, offer no essential differences, and, further, exhibit the particular morbid condition in its inception, throwing a light on its ætiology often obtainable in no other way (Barnes, *loc. cit.*). We are too prone to accept the findings in the dead house as cause rather than effect, and to neglect the opportunity furnished by the pregnant state to observe the affection at its outset and thereby discover the true methods of prevention and cure. Metabolism, in both its forms, here furnishes unequaled opening for study to the physiologist. There is much to be learned from observation of the progress of intercurrent disease—*e. g.*, tuberculosis, under the intense vascular and nervous strain of pregnancy. The same is true of skin affections, both as to their nature and ætiology. The so-called "mask of pregnancy" is the chloasma of other states; herpes gestationis is dermatitis herpetiformis; and here the dermatologists may find a clew to the origin of these affections. These statements are equally applicable in the province of surgery and surgical pathology.

Gynæcology may, with reason and right, be ranked as a specialty, its technical procedures entitling it to such a place, but not so obstetrics.

Repair of injuries produced by labor, instrumental or manual dilatation of the cervix, symphysiotomy, curettage, fall more naturally to the obstetrician only because of his skill and experience in their operative details, not because the general surgeon is not entirely competent to perform them.

Certain measures, as perforation, cephalotripsy, forceps and version operations, manual removal of the placenta, decapitation, evisceration, correction of malpresentations, positions, and attitudes, closely approach the border line of specialism, but some of these have greatly fallen into disuse since the introduction of other perfected operations offering a chance of life to the child.

Cæsarean section itself is merely the removal by the knife of a foreign body from the interior of a hollow viscus whose outlet is partially occluded.

This argument may appear at first sight a digression from the subject in hand, but reflection will show not only the justice but the necessity of its introduction. His student career is the time when the physician is most impressionable, and when facts are most readily brought home and fixed in his mind.

AIDS IN OBSTETRIC TEACHING.*

PART I.

Introduction.

The underlying principles of obstetrics are based upon certain recognized and well-known laws of anatomy, physiology, and physics, which allow of a wide range of illustration.

Without a question, the best single method for the student to acquire a practical and lasting knowledge of midwifery is in the personal and actual care of parturient and puerperal women—no student, however, especially regarding the anatomical and mechanical principles involved, much of his practical experience goes for nothing and is wasted upon him. The shortcomings of the theoretical or didactic obstetric lecture have in the past few years received considerable attention, but most of those who have arraigned the didactic form of instruction in the strongest terms have offered us no substitute other than a general plea for more practical work.

As I stated in the preceding paper, I believe a modified theoretical lecture still has its place in obstetric

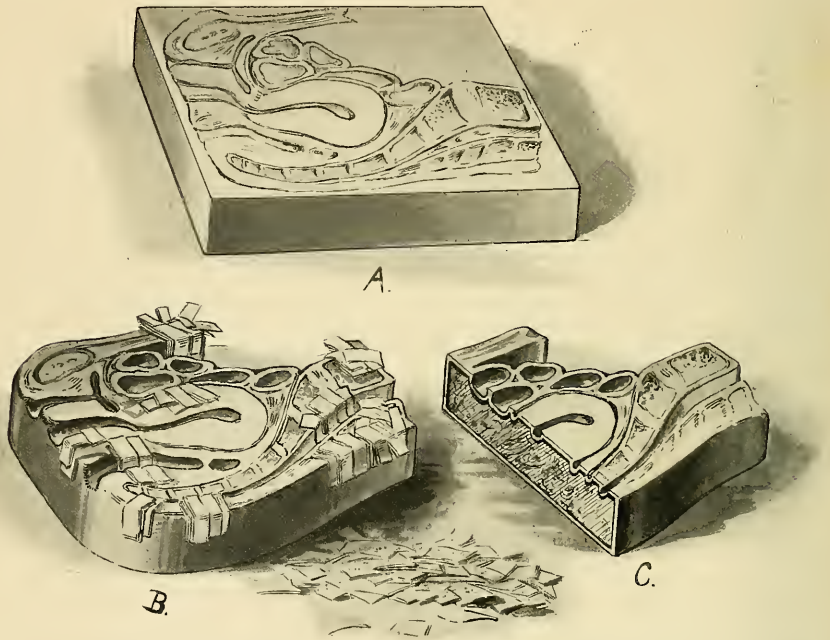


Fig. 9.—*A* represents the model finished in clay and ready to receive the first coat of paper strips moistened in water; *B* represents the clay model covered with the first layer and the application of the paper strips dipped in hot carpenter's glue; *C* shows a transverse section of the completed paper model, with its interior filled with excelsior, and the surface ready for the first coat of paint.

should be allowed this privilege without previous training—and in witnessing various obstetrical procedures in a clinic; but unless his mind has been made familiar with the main principles of the subject, or his attention is fixed at the time by means of abundant illustration, teaching—namely, a didactic lecture that is in part recitation, in part demonstration, and which is freely and abundantly illustrated by various means, some of which I suggest in this paper.

Not a decade ago the memory was the only faculty appealed to and cultivated in the teaching of obstetrics. The student's mind was made the recipient of isolated facts, and required to retain them by brute force as it were. That memory has its place and is an important factor we make no question, but it is the power to ob-

* Read before the American Gynæcological Society at its twenty-first annual meeting, New York, May 26, 1896. [The illustrations are numbered continuously with those in the author's previous article to facilitate reference from the one article to the other.]

ve, to grasp, to comprehend, to utilize, to put two and wo together and reach a logical conclusion—that is the fundamental principle of practical education.

It has been for the readier and better cultivation of those two faculties of the mind, so essential to the medical student—namely, the reason and perception—that necessity has compelled us to invent these various aids in obstetric teaching presented to the American Gynæcological Society to-day. The medical student entering, for example, upon his recitation course in obstetrics in his second college year, will of necessity, both in his reading and his class-room work, encounter many new and unfamiliar words, or many which have heretofore been used in quite another sense, and, moreover, to such an extent that he completely fails to grasp the underlying principles that they are intended to convey. Thus, an elaborate description in the text-book or on the part of the instructor in the recitation room may be absolutely wasted upon the pupil, whereas were simple and familiar objects and models, which possess the third dimension of space, made use of in conjunction with the description, the subject would immediately appeal to the student, new interest would be awakened, and the facts in question be rendered so plain and simple as not readily to be misunderstood or forgotten.

Diagrams fail because they are unreal, because they are not readily understood, because the anatomical relationships are obscured, because only one surface of the object is presented. The model succeeds since the reverse obtains. Take, for example, the flattened pelvis of rhachitis. The student's interest is immediately awakened and held if such a pelvis be placed in his hands with the request to point out the departures from the normal condition.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 10.—Non-gravid uterus (3″ × 2″ × 1″). (Fisster cast from Nature ; ½ natural size ; from a photograph.)

Fig. 11.—Gravid uterus at end of first month (3½″ × 2½″ × 1½″). Marked antero-posterior growth. Pyriform shape preserved. Almost cylindrical. (Plaster cast ; ½ natural size ; from a photograph.)

Fig. 12.—Gravid uterus at end of second month (4½″ × 3½″ × 2″). Further antero-posterior growth. Pyriform shape still preserved. (Paper model ; ½ natural size ; from a photograph.)

Fig. 13.

Fig. 14.

Fig. 13.—Gravid uterus at end of third month (5″ × 4″ × 3″). Pyriform shape gradually disappearing. Shape nearly spherical. (Paper model ; ½ natural size ; from a photograph.)

Fig. 14.—Gravid uterus at end of fourth month (6″ × 5″ × 4″). Marked ovoid. Anterior surface round as a ball ; posterior surface flattened. Corpus uteri furnishes principal element of growth. Tubes considerably below the horns. Size and shape influenced by fœtus, placenta, liquor amnii, and disease. (Paper model ; ½ natural size ; from a photograph.)

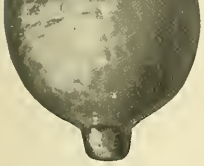


Fig. 15.

Fig. 16.

Fig. 17.

Fig. 15.—Gravid uterus at end of fifth month (7″ × 6″ × 5″). Characteristics same as at end of fourth month. (Paper model ; ½ natural size ; from a photograph.)

Fig. 16.—Gravid uterus at end of sixth month (8½″ × 6½″ × 6″). Ovoid gradually becoming egg-shaped. Posterior wall flattened by spinal column. Tubes considerably below horns. Size and shape influenced by fœtus, placenta, liquor amnii, and disease. (Paper model ; ½ natural size ; from a photograph.)

Fig. 17.—Gravid uterus at end of seventh month (10½″ × 7½″ × 6½″). Egg-shaped. Broadest just below fundus. Longitudinal axis predominates. Posterior wall flattened by spinal column. Tubes still farther below horns. Size and shape influenced by fœtus, placenta, liquor amnii, and disease (Paper model ; ½ natural size ; from a photograph.)

Injuries to the pelvic floor become much more real and easily understood when reproduced in casts, with real sutures in place, than by chalk on the blackboard or diagrams in text-books. So, too, the history of the progress of pregnancy becomes simplified with models of the pregnant uterus to illustrate it; the changes in the vaginal portion of the cervix, the supravaginal portion, the internal and external os, as well as the mechanism of dilatation, and the passage of the fœtus through the os and ostium vaginæ, become realities never to be forgotten, with a series of flexible models to represent the same, which the student is called upon to examine and demonstrate personally.

So in the description of the involution of the puerperium and the relations of the uterus to the surrounding parts, paper reproductions of frozen sections will render us great service in holding the student's attention and fixing the facts regarding them. Moreover, subsequent practical work in the lying-in hospital and outdoor maternity service becomes not only more profitable and instructive to the student, but safer for the patients after such ocular demonstrations of familiar obstetric principles. Again, we have found some of these aids—as the leather puerperal uterus, paper models of pregnant and puerperal uteri, composition cervices, and perineal lacerations—of lasting and practical value in the instruc-

Fig. 18.

Fig. 18.—Gravid uterus at end of eighth month (11½″ × 8″ × 7″). Characteristics same as at end of seventh month. (Paper model; ¼ natural size; from a photograph.)

Fig. 19.

Fig. 19.—Gravid uterus at end of ninth month (13″ × 9½″ × 8½″). Ovoid-shaped. Longitudinal axis predominates. Broad fundus. Anterior surface more convex than heretofore. Posterior depression caused by lumbo-sacral angle. Fundus, rarely regular, depends on posture of fœtus. Fœtal head causes increased development of anterior part of lower uterine segment. "Sacciform dilatation of lower uterine segment." Size and shape influenced by fœtus, placenta, liquor amnii, and disease. (Paper model; ¼ natural size; from a photograph.)

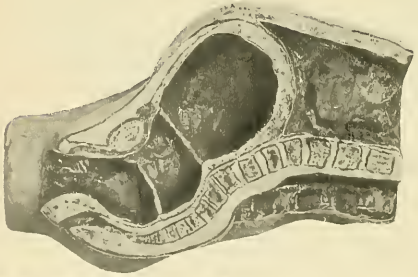


Fig. 20.—Vertical mesial section of the parturient canal at the end of the stage of dilatation, from a woman who died during labor. (After Karl Braune; weight, one pound and three quarters. Paper model. From a photograph.)

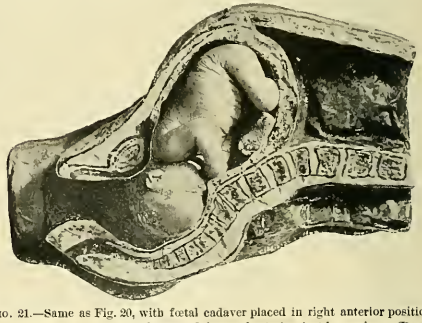


Fig. 21.—Same as Fig. 20, with fœtal cadaver placed in right anterior position of the vertex. Head well engaged, internal rotation just beginning. (Paper model; from a photograph.)

tion in obstetrics of nurses still in the training school of a general or maternity hospital. We have repeatedly observed, by reason of the slight knowledge of anatomy, physiology, and histology which these pupil nurses possess, that demonstrations supplemented by the use of the aids herein set forth, either in the delivery or lecture room, are rendered much more interesting, profitable, and instructive, than a mere dry recital of facts. This is especially true in hospitals in which practically no maternity service is given to the nurses, or in those

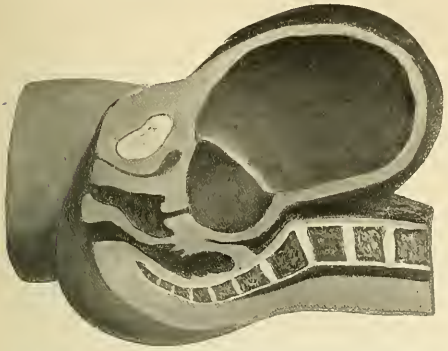


FIG. 22.—Diagrammatic vertical mesial section of parturient canal at beginning of the first stage of labor to illustrate vaginal and supravaginal portions of the cervix. Useful to illustrate posture, presentation, and position of the fœtus, use of vaginal tampon, varieties of cervical dilators, placenta prævia, and many other conditions. (Paper model.)

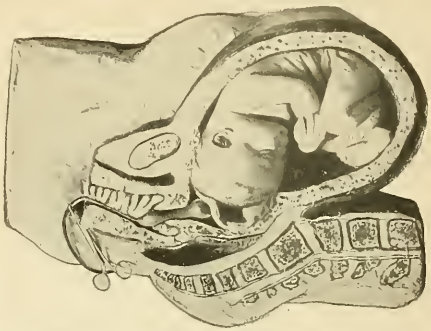


FIG. 23.—Same as Fig. 22; illustrates fœtal cadaver in right anterior position of the vertex, central placenta prævia, Barnes's bag, and vaginal tamponade in position. Demonstrates dangers of the Barnes's bag producing premature separation of the placenta beyond the ring of the internal os and the resulting internal or concealed hæmorrhage by reason of the distal extremity of the Barnes's bag projecting too far into the cavity of the lower uterine segment. (Paper model; from a photograph.)

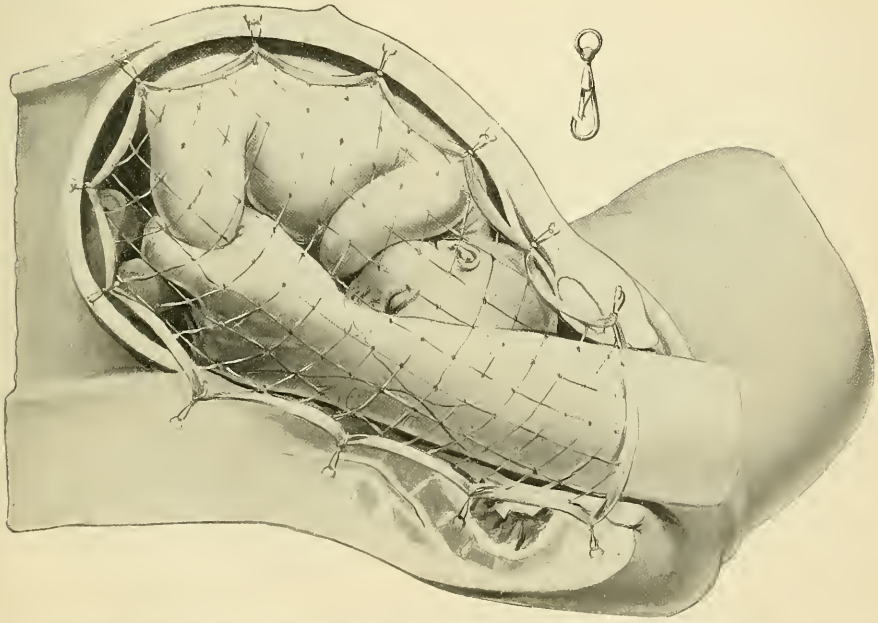


FIG. 24.—Diagrammatic vertical mesial section of parturient canal at end of first stage of labor. The uterine cavity is covered by a netting so as to permit of ocular demonstrations of intra-uterine manipulations. Illustrates internal direct podalic version. (Paper model.)

where the rules of the institution debar the nurse from actually conducting the confinement, or even making a vaginal examination.

Objection is occasionally raised, justly or unjustly, that general obstetric demonstration, apart from the bedside or clinic, carries with it the necessity of handling wet and dried anatomical material—fœtal cadavers, for instance—and, consequently, a suspicion of uncleanliness.

Not the least advantage of the greater number of the aids in obstetric teaching herein described is to be found in the fact that by reason of their composition they may be made and kept obstetrically clean—no small advantage, since we often desire to use the same at the bedside or in the obstetric clinic.

specimens of pelvic deformity, and an interchange of such models, together with their clinical history, may accomplish much to raise the standard of obstetric instruction.

PROPER PLACE FOR MODELS—CAUTIONS REGARDING THEIR USE.

I desire at the outset emphaticaly to disclaim any intention of implying or suggesting that the aids in obstetric teaching herein described and illustrated are in any sense to replace practical bedside instruction. These aids I offer as auxiliaries, as adjuncts for more instructive and interesting obstetric recitations, demonstrations, theoretical lectures, clinics, examinations of pregnancy, and ward instruction in maternity hospitals.

Fig. 25.

Fig. 26.

Mechanism of cervical dilatation in primiparæ (diagrammatic). (Paper models; from a photograph.)

Fig. 27.

Fig. 28.

Mechanism of cervical dilatation in multiparæ (diagrammatic). (Paper models; from a photograph.)

Much that I present in these pages is suggestive and rudimentary in character; much, we feel, can and will be improved upon as time and opportunity offer. For example, I beg leave to suggest that plaster molds be taken of specimens of pregnant uteri of known months of gestation, so that from these subsequently any desired number of *papier-maché* models may be reproduced for exchange among museums and obstetric teachers. The same plan may, I believe, be pursued in the case of

I can confidently assert, as the result of several years' experience in the use of such aids, that they throw new light upon many physiological and mechanical problems of midwifery, and that they moreover lend new interest to many obstetric subjects, which, by reason of their obscureness and dryness, have in the past proved more than stumbling blocks to students, and, I may truthfully add, to practitioners as well.

It can not be too strongly insisted upon that great

FIG. 29.—Vertical mesial section of the pregnant uterus at the beginning of the fifth month of gestation. (Paper model; from a photograph.)

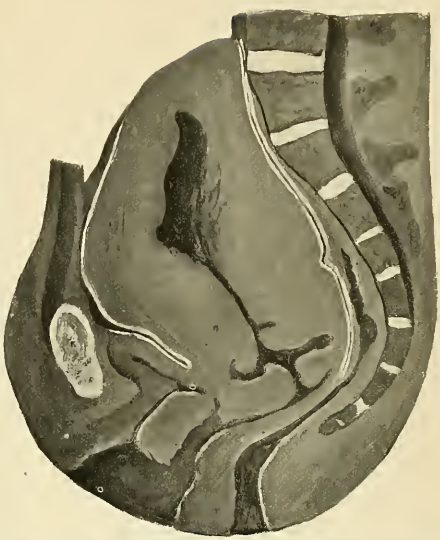


FIG. 30.—Vertical mesial section of puerperal uterus five minutes after delivery. Patient died, heart disease. (After Webster; paper model; from a photograph.)

FIG. 31.—Vertical mesial section of puerperal uterus second day of puerperium. Patient died of eclampsia thirty-six hours after labor. (After Webster; paper model; from a photograph.)

FIG. 32.—Vertical mesial section of puerperal uterus three days after labor. Patient died of acute yellow atrophy. Nearly full term. (After Webster; paper model; from a photograph.)

care must be employed in the selection and use of models as aids in obstetric teaching. Their proper place must be constantly kept before us, and where reproductions from Nature in paper, plaster, composition, or rubber are employed, we have found it safer and generally more satisfactory to produce the natural size of the object, as by enlarging, the subject may become merely grotesque, or even convey a false impression. A wrong impression, moreover, readily acquired, is often less easily corrected in this connection.

If proper care is taken in the selection and preparation of models, no false or exaggerated impression will be conveyed, and the production of models in three dimensions of space, at which we always aim, secures for us a means of ocular demonstration and illustration, which diagrams and charts, be they ever so beautifully executed, or even blackboard illustration with an abundant supply of colored chalk, can never equal. Diagrams are unsatisfactory; they soon become tiresome to the student, and they may be misleading because of the loss of the third dimension of space.

The attempt on the part of the student to acquire a correct and clear idea of certain fundamental obstetric principles from a study of a

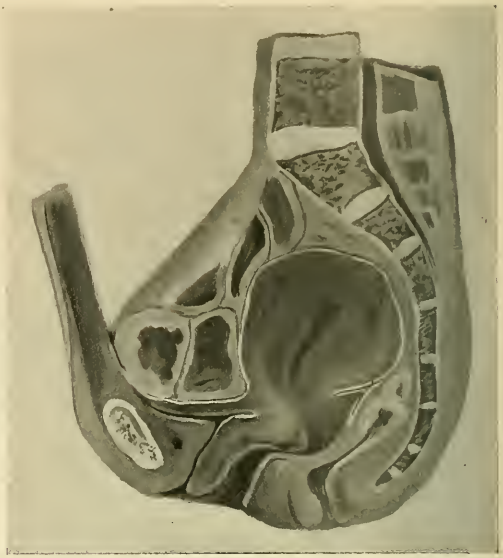


FIG. 33.—Vertical mesial section of puerperal uterus fifteen days after labor. Patient died of heart disease. (After Webster; paper model; from a photograph.)

FIG. 35.

FIG. 36.

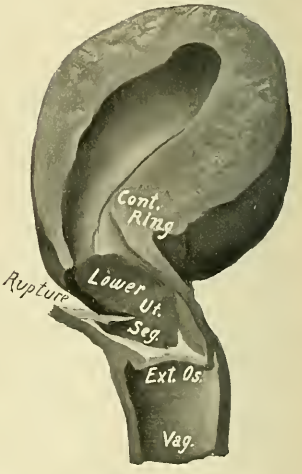


FIG. 37.

FIG. 35.—Complete rupture of the uterus involving left lateral and posterior walls and extending from the contraction ring almost to the external os, which latter is intact. Also complete rupture of posterior vaginal wall just below external ring, opening into Douglas's pouch. (After a specimen in the Museum of the Munich Frauenklinik; paper model; from a photograph.)

FIG. 36.—Complete rupture of the left posterior wall of the uterus, extending from the contraction ring downward and inward across the lower uterine segment, through the external os, and some distance down the posterior vaginal wall. This illustrates a particularly dangerous form of rupture of the genital tract, because of the possibility of direct infection of the peritoneal cavity by the vaginal secretions. (Paper model; from a photograph.)

FIG. 37.—Transverse rupture of the uterus through the lower uterine segment at a point halfway between the contraction ring and the external os. Cancer of the cervix. Vertical mesial section. (Paper model; from a photograph.)

series of illustrations in his text-book or in the lecture room is very apt to result in a condition of bewilderment on his part, which could readily have been avoided by the free use of a few simple models. With such models, recitations and demonstrations to classes divided into easily handled sections can be made to result in much practical gain to the student, who has up to this point obtained his knowledge of obstetrics from text-books merely.

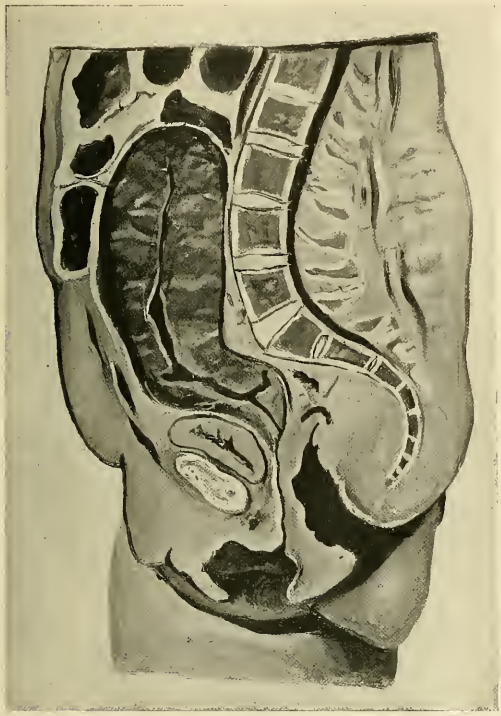


FIG. 34.—Vertical mesial section of puerperal uterus half born after labor. Contracted pelvis. (After Stratz; paper model; from a photograph.)

VARIOUS KINDS OF AIDS.

For purposes of convenience we shall enumerate and describe the several kinds of aids to obstetric teaching included in this paper under the following headings:

I. Plaster models.

II. Paper reproductions of clay models and plaster casts.

III. Composition models.

IV. Miscellaneous models and aids.

V. Electro-plated casts and models.

I. *Plaster Models.*

Experience has taught us that plaster models *per se* have a very limited field in this direction. Unless the subjects be small and compact, the tendency of the plaster to break, and the excessive weight in the case of the large ones, are decided objections.

Plaster, however, will answer very well for the smaller uteri of the early months, and has been of service to us in securing first impressions of lacerations, pregnant uteri, external genitals, etc., which are subsequently reproduced in paper, composition, rubber, or rendered serviceable and durable by electro-plating with copper, as described hereafter.

II. *Paper Reproductions of Clay and Plaster Models.*

After experimenting with various kinds of *papier-maché*, *papier-maché* compositions, and modified plaster, we have found the method proposed by Dr. W. G. Thompson * as best suited for our purpose, because of the lightness, durability, and cheapness of the models made by this process.

In addition to the plaster model, all that we require is an abundant supply of old newspapers, some carpenter's glue, shellac, or a good varnish, and some ready-mixed paints. The clay model or plaster-cast model having been made (see Fig. 9, *A*), it is first covered on one side with a single layer of small pieces of newspaper (two by four) moistened in cold water (see Fig. 9, *B*). Every portion of the model or cast is thus covered with a single layer, and rapidly laid upon this layer successive layers of paper dipped in hot glue are added. By means of a flat brush time is saved by painting the glue over the surface and rapidly laying the strips of paper upon it. Special care is needed with the last layer of strips only, in order to secure a smooth surface (see Fig. 9, *C*). The number of layers and subsequent thickness of the wall should depend upon the character and size of the model. In large models wire gauze, strips of cheese cloth, cardboard, and even thin slabs of pine, may with advantage be incorporated with the paper and glue to add stability. The casing is now allowed to dry thoroughly upon the clay or plaster mold, and is then removed either entire or in two or more sections when the former can not be done (see Fig. 9, *C*).

If the model represents, for instance, a sagittal section, the interior is now carefully stuffed with loose newspaper or excelsior, and a back added by means of larger

* The Use of Automatic and other Models in teaching Physiology. *Researches of the Loomis Laboratory*, vol. ii, 1892.

pieces of newspaper, strengthened with cheese cloth, glued in the same manner as the above (see Fig. 9, *C*). When this has thoroughly dried, a couple of thick coats of paint are applied, to represent the object, and the whole shellacked or varnished. For accuracy in the reproduction of frozen sections (see Figs. 20, 29, 30, 31, 32, 33, and 34), diagrams of sagittal sections (see Figs. 22, 23, 24, 25, 26, 27, and 28), pathological specimens (see Figs. 35, 36, and 37), we have photographed the cuts or rephotographed the photographs, then with an enlarging lantern thrown the outline of the figure upon a sheet of the thinnest tissue paper until the desired size was obtained, and outlined the object with a heavy pencil. Then, placing the paper upon the smooth layer of clay, the modeling is done directly through the paper, the moisture of the clay finally absorbing the tissue paper. Thus, absolute accuracy of detail and relationship can be obtained. The reproductions of Webster's frozen sections (Fig. 20) were made in this manner.

"When finished, the model becomes as hard as board and it possesses great advantage over *papier-maché*, which is more expensive and usually brittle, unless subjected to great pressure.

"This new composition is smooth and very hard, watertight (for cold water), it never warps, breaks, or cracks, and when painted it is difficult to believe that it has been made of such cheap material."

An almost endless variety of anatomical and physiological obstetrical models may be thus secured.

Transverse and sagittal sections are reproduced, as shown above. Where oval or round objects, as pregnant uteri or tumors, are to be reproduced, the entire specimen is covered with the paper as above described, allowed to dry, then cut in halves, the clay or plaster allowed to drop out, and the two shells stuffed with excelsior and glued together with several layers of paper strips overlapping at the seam.

1. Size and shape of the uterus during the successive months of gestation.

These paper models here illustrated are, with the exception of the normal uterus, not taken from Nature, but are founded upon the collective descriptions and average measurements given by Webster, Hart and Barbour, Ribemont-Dessaigners, Farr and Tanner.

Should opportunity offer, more valuable and precise models could undoubtedly be produced by making, immediately after death, plaster casts of gravid uteri, and then subsequently paper reproductions of the same. We would offer here as a suggestion, as we do in another place, that casts of such uteri from the cadaver be made which can subsequently be reproduced in paper and exchanged among obstetric teachers and museums. Many are the uses to which such paper uteri may be put: The height of the fundus in the several months in and out of the pelvis; the changes in the shape of the fundus and lower uterine segment, and their influence upon the attitude, presentation, and position of the fœtus; placental insertion; physiology and pathology of pregnancy and labor; and many other conditions that will constantly suggest themselves, so that such models will be in almost constant use during a course of obstetric teaching.

2. Vertical mesial sections of uteri at term; mechanism of cervical dilatation.

Fig. 20 is a reproduction in paper of Braune's frozen section of the parturient uterus at the end of the first stage, and Fig. 21 is the same, with a fœtal cadaver introduced to illustrate presentation and position.

Fig. 22 is a diagrammatic representation of a vertical mesial section of a uterus at the beginning of the first stage of labor, before the disappearance of the supravaginal portion of the cervix. The uses to which these two models can be put are almost endless, and students in a short time can be brought to appreciate obstetric conditions and situations which hours of explanation formerly were required to elucidate.

For example, the model of Fig. 20 can easily be made to demonstrate the curve of the parturient canal, normal and abnormal attitude, presentation and position of the fœtus, displacement of the small parts, and so on.

So the diagrammatic model of the uterus (Fig. 22), with its cervical canal dilated to the size of one finger, has proved of value in exhibiting various forms of cervical dilators, as Tarnier's Barnes's, Champetier de Ribes's, and others, and the advantages and the disadvantages of each; the varieties of placenta prævia; the uses and action of the vaginal tampon; and many other conditions that will suggest themselves to the instructor.

Fig. 24 also represents a diagrammatic vertical mesial section of the uterus, its open side fitted with netting in order to retain the fœtal cadaver or puppet during demonstrations of the intra-uterine manipulations accompanying different varieties of version, reposition of prolapsed small parts, correction of malpositions and postures.

The models representing cervical dilatation in primiparæ and multiparæ, in Figs. 25 to 28, will, to a more limited extent, be found useful.

3. Reproductions of frozen sections of gravid and puerperal uteri.

It has been with some hesitation that I have attempted the reproduction of the frozen sections of Webster and Stratz for fear that something of the original would be lost or distorted in the paper model. We have therefore confined our work to the grosser ones, as the puerperal uteri of Webster. In only one instance have I attempted to produce a model of the gravid uterus and its contained ovum (Fig. 29), and the result was not altogether satisfactory. For such illustrations quite as much can, we believe, be accomplished by diagram.

The series of models representing involution, position and relationships of the puerperal uteri, after Webster's frozen sections, we have found of marked aid in

demonstrating many conditions associated not only with the physiology, but also the pathology of the puerperium * (Figs. 30 to 34).

4. Rupture of the uterus and vagina during labor.

These models were made with a view to showing the most frequent site of uterine rupture, the relation of the rupture to the contraction ring and external os, and the greater danger of infection when the tear involves the vagina as well as the uterus.

* Barbour, in the *Edinburgh Medical Journal*, October 18, 1895, in a series of papers upon the study of frozen sections, after passing in review the various sections described by different investigators, makes an estimate of the value of this method of study, as follows: Barbour considers that, by means of such sections, we have gained most in knowledge regarding the birth canal. He acknowledges the limitations which are inevitable in such study, but considers that we have by this method acquired ideas which have revolutionized our conceptions of study.

AIDS IN OBSTETRIC TEACHING.

PART II.

III. *Composition Models.*

In casting about some time since for a cheap substitute for rubber in the construction of models, our attention was directed to the glue composition which modelers and plaster workers have for years made use of in the manufacture of their interior decorations. Our aim was to produce flexible cervices and pelvic floors by this method, and after much experimenting we were compelled to confine our models in composition here described to a series of parturient cervices in different

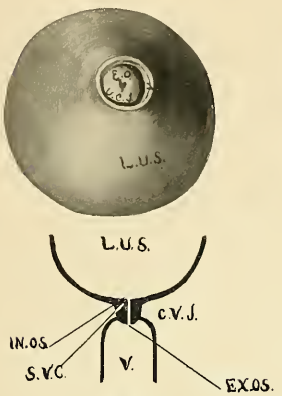


Fig. 38.

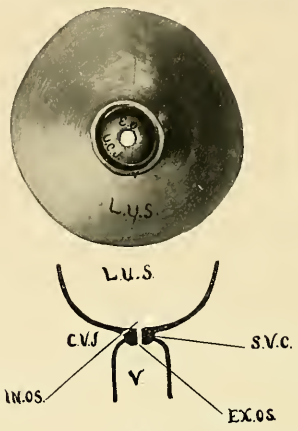


Fig. 39.

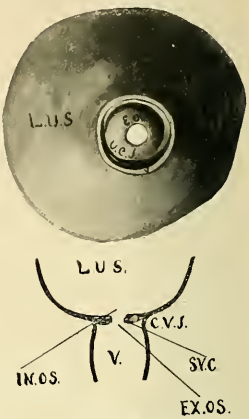


Fig. 40.

Fig. 38.—Cervix in latter part of gestation or at beginning of labor. Vaginal and supravaginal portions of cervix unchanged. *v.*, cuff of vagina; *ex. os.*, external os and infravaginal portion of the cervix; *c. v. j.*, cervico-vaginal junction; *s. v. c.*, supravaginal portion of cervix; *in. os.*, internal os; *l. u. s.*, lower uterine segment. (Composition model; from a photograph.)

Fig. 39.—Lower uterine segment during labor. Cervix in progress of being drawn up into the body of the uterus. Supra- and infravaginal portions of the cervix still present. *v.*, cuff of vagina; *ex. os.*, external os and infravaginal portion of cervix; *c. v. j.*, cervico-vaginal junction; *s. v. j.*, supravaginal portion of cervix; *in. os.*, internal os; *l. u. s.*, lower uterine segment (Composition model; from a photograph.)

Fig. 40.—Lower uterine segment during labor. *v.*, cuff of vagina; *ex. os.*, external os, infravaginal portion of cervix has disappeared; *c. v. j.*, cervico-vaginal junction; *s. v. c.*, supravaginal cervix, small portion only remaining; *in. os.*, internal os; *l. u. s.*, lower uterine segment. (Composition model; from a photograph.)

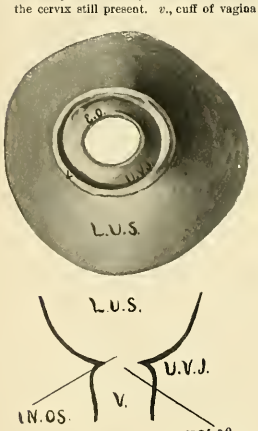


Fig. 41.

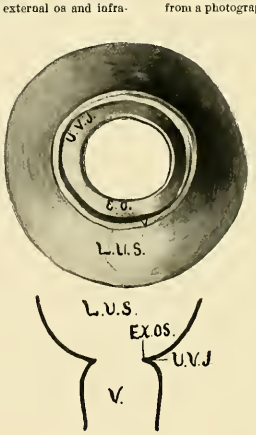


Fig. 42.

Fig. 43.

Fig. 41.—Lower uterine segment during labor. Os uteri in progress of dilatation. Supra- and infravaginal portions of the cervix have disappeared. Os one third dilated. *v.*, cuff of vagina; *ex. os.*, external os; *u. v. j.*, utero-vaginal junction; *l. u. s.*, lower uterine segment. (Composition model; from a photograph.)

Fig. 42.—Lower uterine segment during labor. Os uteri almost fully dilated. *v.*, cuff of vagina; *ex. os.*, external os; *u. v. j.*, utero-vaginal junction; *l. u. s.*, lower uterine segment. (Composition model; from a photograph.)

Fig. 43.—Lower uterine segment at completion of first stage of labor. Os uteri completely dilated. *v.*, cuff of vagina; *ex. os.*, border of external os, scarcely perceptible; *u. v. j.*, utero-vaginal junction. (Composition model; from a photograph.)

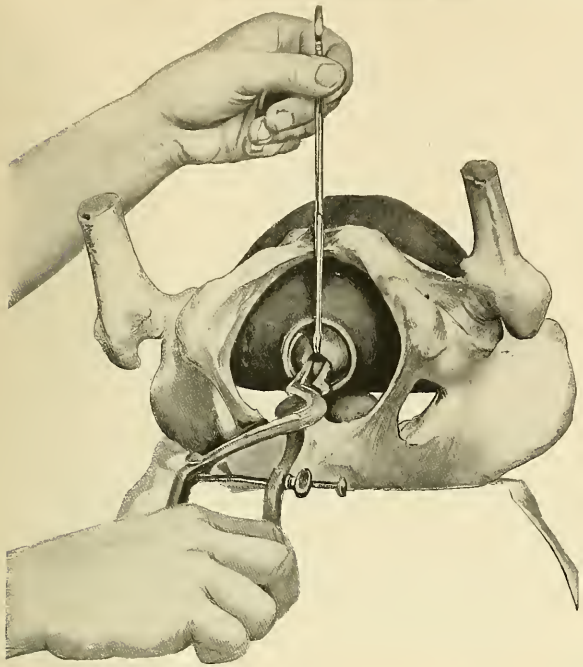


FIG. 44.—Instrumental dilatation of parturient os preparatory to further manual dilatation, gauze packing, the introduction of bougies for the induction of labor, or cervical dilators. (Composition model; from a photograph.)

stages of dilatation (Figs. 38 to 43), and, after all, fall back on rubber for the pelvic floor (Fig. 63).

The composition mixture finally adopted was one of Cooper's A-1 glue and pure glycerin, the same as that used by modelers and plaster workers, with the addition of glycerin, to give the mass lasting flexibility, the glue being chosen in preference to gelatin because of its being cheaper. The proportion of the glue and glycerin will depend upon the degree of flexibility of the model desired. I have found that a proportion of one part of glue to one of glycerin gives the proper flexibility to the mass for the cervices subsequently described.

The method is very simple and, aside from the glycerin, very cheap. The glue is first soaked in cold water until moist; the excess of water is then removed by filtering through stout burlap or other filtering material. Then, placed over a water bath, the glue is melted, the glycerin added, and the mass allowed to boil until most of the small amount of water contained in it is expelled. Subsequent contraction and hardening of the model will depend upon the completeness with which the water passes off at this time. The time required for this heating process will depend upon the size of the mass and the amount of the contained water.

When ready to pour, the mass should be almost free from water, of a thick, creamy consistence, and no small pieces of glue should remain unmelted.

At this time any desired color may be imparted to the composition by the addition of a strong alcoholic solution of any of the aniline series.

Preparation of the Mold.—Given a clay, plaster, *papier-maché*, or other model, which it is desired to reproduce in glue composition, it is first necessary to construct a mold. For the composition cervices (Figs. 38 to 43) the lower segment of the *papier-maché* model of the pregnant uterus at the eighth month (Fig. 18) was used. A negative mold of the lower third of this uterus was taken in plas-

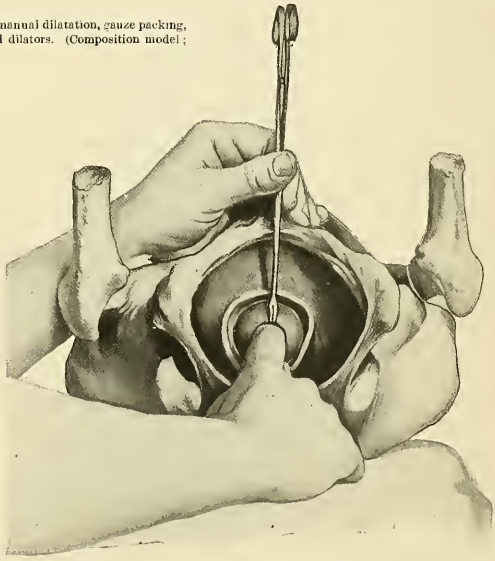


FIG. 45.—Digital dilatation of the parturient os. Os admits one finger. Vaginal and supravaginal portions of the cervix present. (Composition model; from a photograph.)

ter in the usual way. Then, to secure the desired thickness of the composition model, a layer of clay of the required thickness was carefully placed in the negative mold, completely and smoothly lining it. Plaster is now run in over the clay to form the core of the interior of the mold. The plaster being thoroughly hard, the core and negative mold are separated, the clay removed from the negative mold, both carefully shellacked upon their opposing surfaces, and when dry are oiled and fastened firmly together. The mold is now ready for the reception of the heated glue mass.

Pouring the Composition and casting the Model.—In pouring the mass care should be used that it is not too hot, otherwise it is liable to stick to the mold and core by removing the coating of shellac therefrom. Moreover, we have found that the higher the temperature at which the mass is poured the greater will be the subsequent contraction of the model upon cooling. At ordinary temperatures the models should not be removed from the molds for at least six hours.

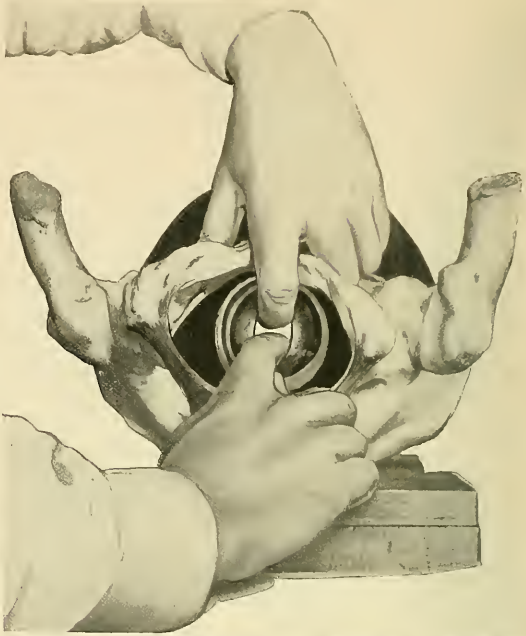


FIG. 46.—Bimanual dilatation of the parturient os. Os admits two fingers. Vaginal and supra vaginal portions of the cervix present. Commencing shortening of the cervical canal. (Composition model; from a photograph.)

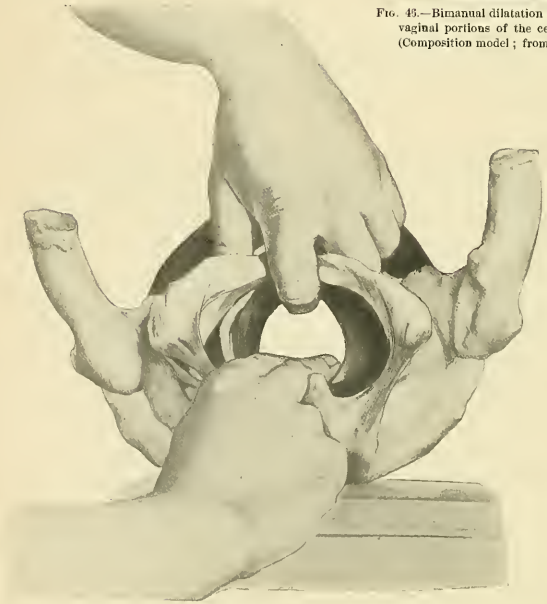


FIG. 47.—Bimanual dilatation of the parturient os. Os admits three fingers. Supravaginal portion of the cervix disappearing. (Composition model; from a photograph.)

I have not found it necessary in these obstetric models to keep them when not in use in their molds to avoid distortion, as Freeborn * advised in pathological models.

Remelting the Models.—Should the models, after continued use, shrink or become hard, remelting and adding an additional quantity of glycerin to the mass will lend new flexibility to the models and render them less liable to shrink.

I desire to express my indebtedness to Mr. James M. Kerr, of the firm of Kerr & Rasario, sculptors, 229 West Thirty-second Street, New York, for valuable instruction and assistance in the use of plaster and composition for the purpose indicated in this paper.

1. Series of composition models of lower uterine segment, showing mechanism of dilatation, with the gradual disap-

* Freeborn A New Material for Models. *Proceedings of the New York Pathological Society* for 1891.

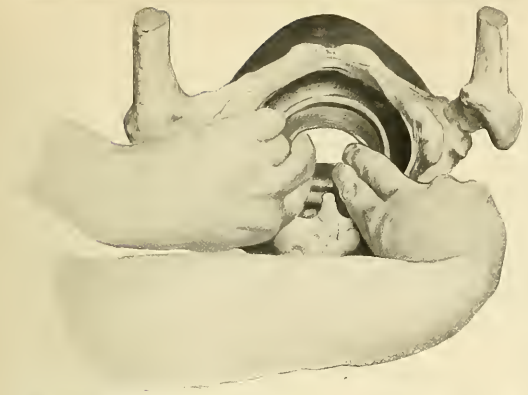


FIG. 48.—Bimanual dilatation of the parturient os. Os one half dilated. Lateral position of the hands. (Composition model; from a photograph.)

pearance of the supravaginal portion of the cervix.

Figs. 38 to 43 represent these composition cervices, and we have added, to render the illustrations more graphic, an outline sketch of the upper vagina and cervix of each to indicate the changes in cervical canal, external and internal os, as dilatation progresses.

The uses to which such simple composition models can be put are almost endless, and we have illustrated some of these in the following illustrations:

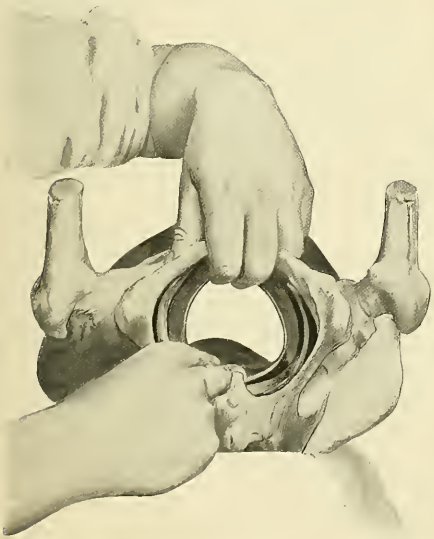


FIG. 49.—Bimanual dilatation of the parturient os. Os two thirds dilated. Entire effacement of internal os. (Composition model; from a photograph.)

Bimanual Dilatation of the Parturient Os.—Series Figs. 44 to 50 indicate our preferred method of combined instrumental and bimanual dilatation of the parturient os. The limits of the present paper forbid my entering upon the arguments in favor of this particular variety of manual dilatation, which has been given an abundant trial over a period of several years in many conditions of the parturient cervix.

I feel justified, however, in stating in this place that this method of bimanual dilatation of the os is to be preferred to other digital and instrumental methods, because (1) the membranes are preserved throughout the operation or until full dilatation is ob-

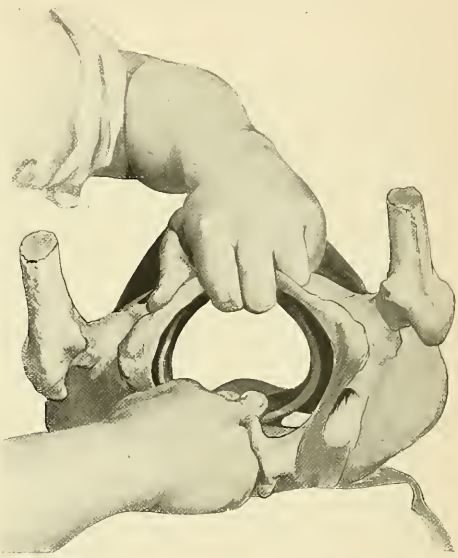


FIG. 50.—Bimanual dilatation of the parturient os. Os fully dilated and being stretched to prevent accidents to the after-coming head. (Composition model; from a photograph.)

tained; (2) there is no interference with the original presentation and position; (3) the sense of touch of the operator's fingers is unimpaired; (4) there is no constriction of the operator's hands; (5) the amount of force exerted upon the external ring can be better estimated, and hence there is less likelihood of lacerations occurring.

Fig. 51 represents the position of the fingers at the ring of the os in bimanual dilatation; no encroachment into the uterine cavity occurs.

Fig. 52 shows the position of the hands as seen in

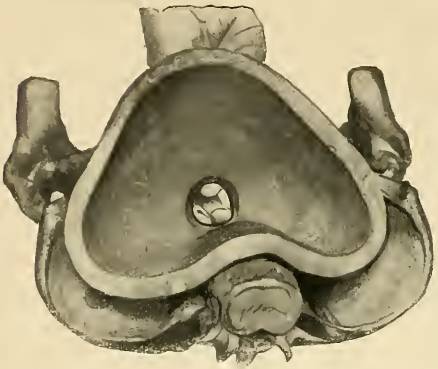


Fig. 51.—Bimanual dilatation of the parturient os, internal view, showing position of the fingers. Os admits three fingers readily. Internal os still present. No encroachment of the fingers upon the cavity of the lower uterine segment. (Composition model; from a photograph.)

an operation on the living subject, and is from a photograph taken at the Emergency Hospital.

Ordinary Digital and Manual Dilatation of the Parturient Os.—Figs. 53 and 54 represent the ordinary digital (with one hand) and manual dilatation of the os, in both of which methods there is unnecessary and dangerous encroaching on the part of the operator's hand upon the lower uterine segment and the consequent dangers of (1) displacement of presentation or position; (2) displacement of arms or cord; (3) premature rupture of the membranes, and loss of the valuable assistance of the liquor amnii in subsequent manipulations, as version, for instance; (4) premature separation of a placenta prævia; and (5) constriction and loss of sensation in the operating hand, and with the consequent danger of lacerations of the external ring from inability to measure the amount of force exerted and the tension of the ring, together with failure to completely paralyze the ring, so that trouble in the extraction of the after-coming head results.

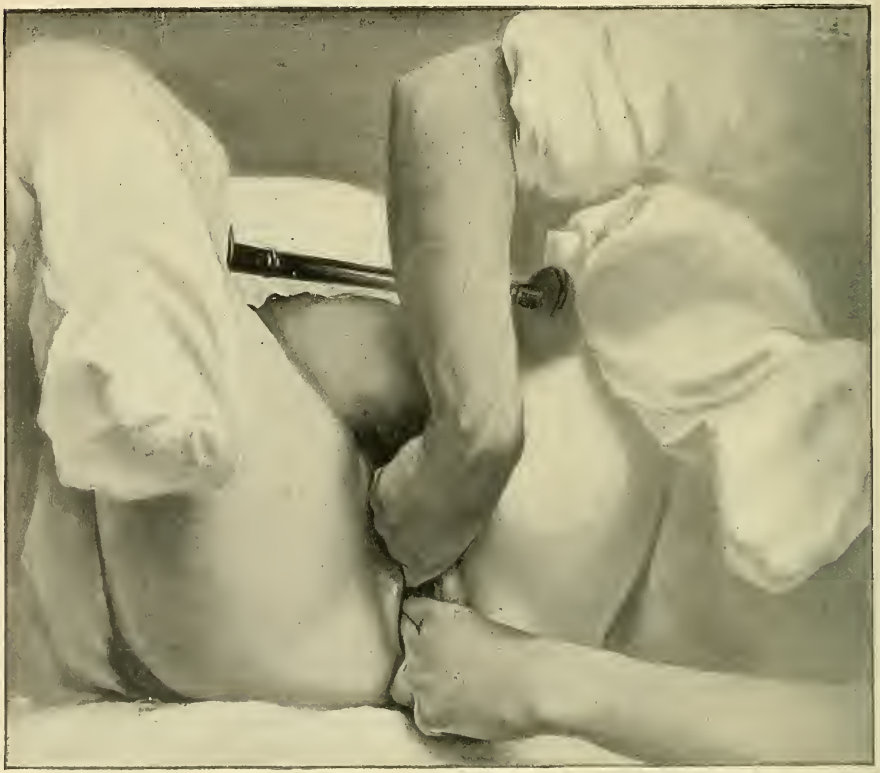


Fig. 52.—Bimanual dilatation of the parturient os. External view, showing position of hands. (After a photograph of the operation taken at the Emergency Hospital.)

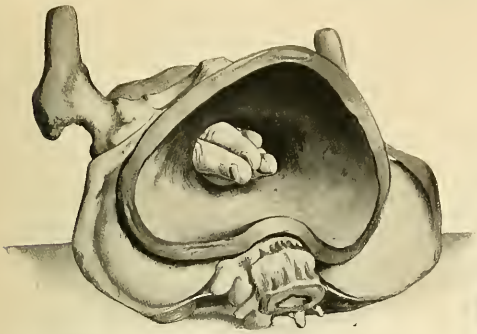


Fig. 53.—Illustrates a common method of manual dilatation of the parturient os and the dangers that ensue of prematurely rupturing the membranes, displacing the presenting part or separating a placenta prævia, by reason of the marked encroachment of the fingers of the operator into the cavity of the lower uterine segment. (Composition model; from a photograph.)

Fig. 54.—Illustrates a common method of single-handed manual dilatation of the parturient os, which has the same objections as the method depicted in Fig. 53, but to a less degree. (Composition model; from a photograph.)

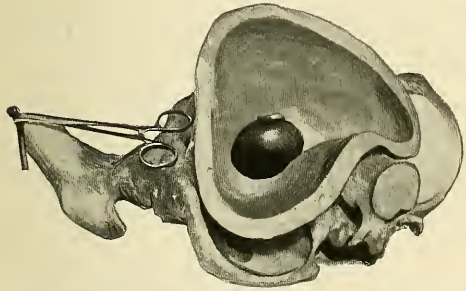


Fig. 55.—Barnes's bag in position in a cervix that admits two fingers. Shows encroachment of the distal end of the dilator into the cavity of the uterus, and the possible dangers of displacement of the presenting part, or premature separation of a placenta prævia, and consequent internal or concealed hæmorrhage. (Composition model; from a photograph.

Fig. 56.—Dangers of breech extraction through an imperfectly dilated os. External os not fully dilated. Traction on the legs causes extension of the head and both arms. Seen from the vagina. (From a photograph; composition model.)

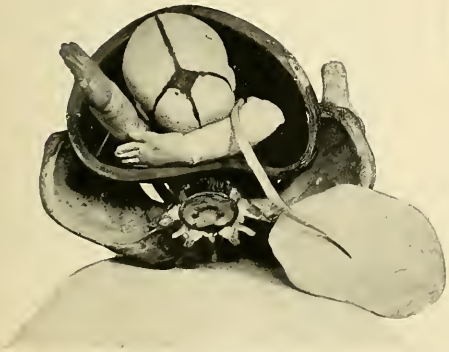


Fig. 57.—Dangers of breech extraction through an imperfectly dilated os. Same as Fig. 56. Seen from the uterine cavity. (Composition model; from a photograph.)

Fig. 55 shows the interior of the lower uterine segment, with an os the size of two fingers, a Barnes's cervical dilator in position, and the dangerous encroachment of the latter into the cavity of the uterus, rendering malpresentation liable to occur.

Dangers of Breech Extraction through an Imperfectly Dilated Os.—Figs. 56 and 57 illustrate this condition, selected from many other equally important ones.

When the student is made to see what may happen

Fig. 58.—Cervix partially dilated. Membranes ruptured. Vertex presenting. Prolapse of hand and cord. (Composition model; from a photograph.)

Fig. 59.—Cervix partially dilated. Labor obstructed by reason of partial extension of the head, causing occipito-frontal diameter to pass through cervix and pelvis. (Composition model; from a photograph.)

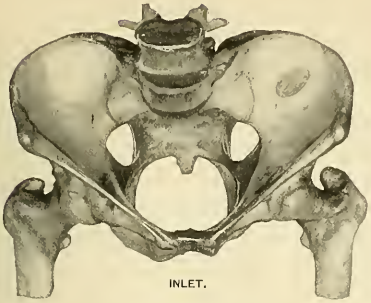
should he thoughtlessly make traction upon a leg in breech presentation before the completion of the first stage of labor, he is not likely to forget the dangers of such manipulations in the extended head and arms and the resulting impaction and death of the fœtus.

Fig. 58 represents prolapse of the cord and hand in the middle of the first stage, and its accompanying dangers to the fœtus; and Fig. 59 illustrates a common cause of obstructed labor due to an imperfect attitude of the fœtus. The chin has left the sternum, resulting in incomplete flexion of the head and the passage of a larger diameter than necessary (occipito-frontal) through the cervix and pelvis.

The following twenty-four groups of illustrations are from photographs of copper-plated plaster models.

GROUP I.—NORMAL PELVIS. MALE TYPE.

(¼ natural size.)



INLET.

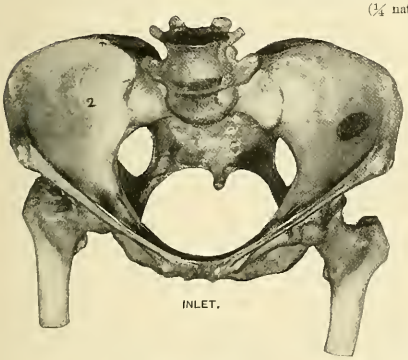
LUMBO-SACRO-COCCYGEAL CURVE.—INCLINATION AND SHAPE OF SYMPHYSIS.—PUBIC ARCH AND ANGLE.

OUTLET.

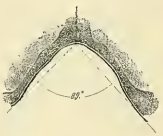
MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	24	61	TRANSVERSE OF INLET,	5	12½
TROCHANTERS,	12½	32	RIGHT OBLIQUE INLET,	4¾	12
Spines,	9⅛	23	LEFT OBLIQUE INLET,	4¾	12
Crests,	10¾	27½	HEIGHT RIGHT PELVIC WALL,	4¼	11
External Conjugate,	6¼	16	HEIGHT LEFT PELVIC WALL,	4¼	11
RIGHT EXTERNAL OBLIQUE,	8¼	21	HEIGHT POSTERIOR PELVIC WALL,	4⅛	10½
LEFT EXTERNAL OBLIQUE	8¼	21	LENGTH SACRO-COCCYGEAL CURVE	5¼	13½
Height of Symphysis,	1⅜	5	TRANSVERSE OUTLET,	3½	9
OIAGONAL CONJUGATE	4⅞	12	ANTERO-POSTERIOR OUTLET (COCCYGEAL),	3¼	8½
ANATOMICAL CONJUGATE,	3⅞	10	ANTERO-POSTERIOR OUTLET (SACRAL)	4¼	11
Obstetric Conjugate,	3⅝	9	CURVE OF SACRUM,	MODERATE	
			PUBIC ANGLE	88°	

GROUP II.—NORMAL PELVIS. FEMALE TYPE.

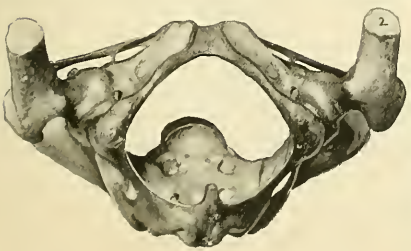
(¼ natural size.)



INLET.



LUMBO-SACRO-COCCYGEAL CURVE.—INCLINATION AND SHAPE OF SYMPHYSIS.—PUBIC ARCH AND ANGLE.

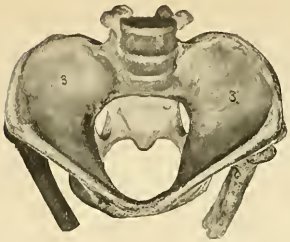


OUTLET.

MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	23¼	59	TRANSVERSE OF INLET,	5	12½
TROCHANTERS,	11½	29	RIGHT OBLIQUE INLET,	5	12½
Spines,	9¾	25	LEFT OBLIQUE INLET,	5	12½
Crests,	11	28	HEIGHT RIGHT PELVIC WALL,	4¼	11
External Conjugate,	7	18	HEIGHT LEFT PELVIC WALL,	4¼	11
RIGHT EXTERNAL OBLIQUE,	8¼	21	HEIGHT POSTERIOR PELVIC WALL,	4½	11½
LEFT EXTERNAL OBLIQUE,	8¼	21	LENGTH SACRO-COCCYGEAL CURVE	5	12½
Height of Symphysis,	1¾	4½	TRANSVERSE OUTLET,	4	10
OIAGONAL CONJUGATE,	4½	11½	ANTERO-POSTERIOR OUTLET (COCCYGEAL),	3¾	9½
ANATOMICAL CONJUGATE,	4	10	ANTERO-POSTERIOR OUTLET (SACRAL),	5	12½
Obstetric Conjugate,	3⅞	10	CURVE OF SACRUM,	MODERATE	
			PUBIC ANGLE	89°	

GROUP III.—PELVIS DEFORMED BY CONGENITAL DISLOCATION OF BOTH FEMURS. CHILD TEN YEARS OLD.

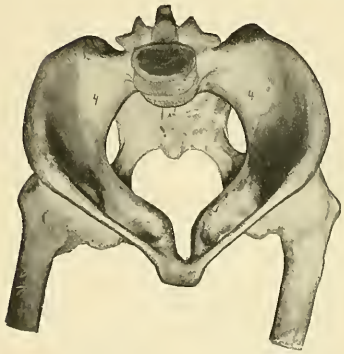
(¼ natural size.)

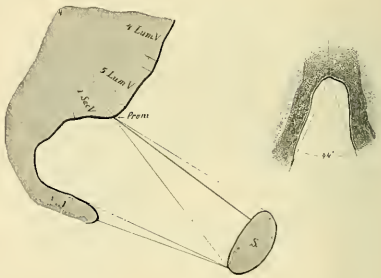


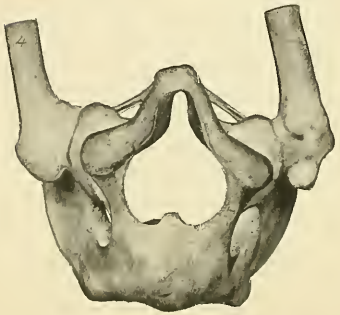
MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	16½	42	TRANSVERSE OF INLET,	2¾	7
TROCHANTERS,	8¼	21	RIGHT OBLIQUE INLET,	3	7½
Spines,	6¾	17	LEFT OBLIQUE INLET,	2¾	7
Crests,	6¾	17	HEIGHT RIGHT PELVIC WALL,	3	7½
External Conjugate,	4½	11½	HEIGHT LEFT PELVIC WALL,	2¾	7
RIGHT EXTERNAL OBLIQUE,	5½	14	HEIGHT POSTERIOR PELVIC WALL,	3⅜	8½
LEFT EXTERNAL OBLIQUE	5¼	13½	LENGTH SACRO-COCCYGEAL CURVE	4	10
Height of Symphysis,	1⅜	3½	TRANSVERSE OUTLET,	2¾	7
DIAGONAL CONJUGATE,	3¾	9½	ANTERO-POSTERIOR OUTLET (COCCYGEAL),	2⅛	5½
ANATOMICAL CONJUGATE	3⅛	8	ANTERO-POSTERIOR OUTLET (SACRAL),	2¾	7
Obstetric Conjugate,	3	7½	CURVE OF SACRUM,	MODERATE	
3			PUBIC ANGLE	96°	

GROUP IV.—PELVIS DEFORMED BY EXTREME DEGREE OF OSTEOMALACIA. (DUPUYTREN MUSEUM.)

(¼ natural size.)



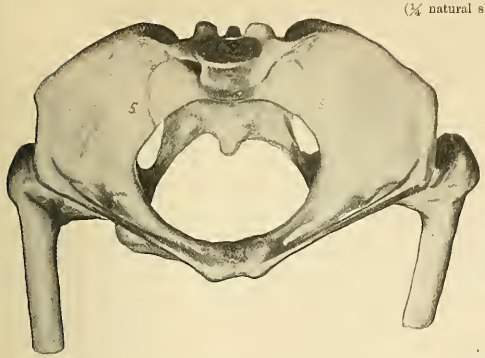


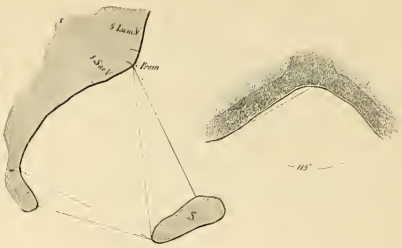


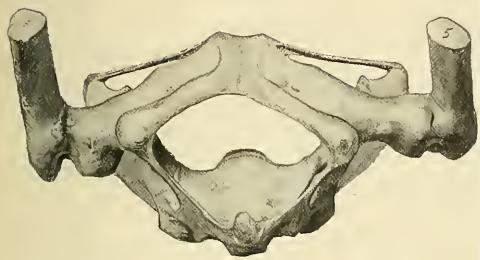
MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	24¼	61½	TRANSVERSE OF INLET,	+¼	11
TROCHANTERS,	9⅞	25	RIGHT OBLIQUE INLET,	+¼	11
Spines,	7½	19	LEFT OBLIQUE INLET,	+¼	11
Crests,	8¾	22	HEIGHT RIGHT PELVIC WALL,	+	10
External Conjugate,	8¼	21	HEIGHT LEFT PELVIC WALL,	+	10
RIGHT EXTERNAL OBLIQUE,	8½	21½	HEIGHT POSTERIOR PELVIC WALL,	2⅞	7½
LEFT EXTERNAL OBLIQUE	8¼	21	LENGTH SACRO-COCCYGEAL CURVE	5¼	13½
Height of Symphysis,	2	5	TRANSVERSE OUTLET,	2¾	7
DIAGONAL CONJUGATE,	5½	14	ANTERO-POSTERIOR OUTLET (COCCYGEAL),	+	10
ANATOMICAL CONJUGATE,	5	12½	ANTERO-POSTERIOR OUTLET (SACRAL),	5¼	13½
Obstetric Conjugate,	4¾	12	CURVE OF SACRUM,	INCREASED	
4			PUBIC ANGLE	+4°	

GROUP V.—PELVIS DEFORMED BY CONGENITAL DISLOCATION OF BOTH FEMURS.

(¼ natural size.)



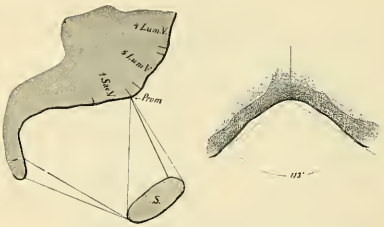


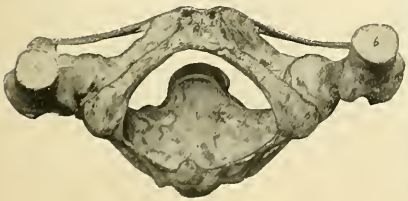


MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	24½	62	TRANSVERSE OF INLET,	5½	14
TROCHANTERS.	13½	34½	RIGHT OBLIQUE INLET,	5	12½
Spines,	10¾	26½	LEFT OBLIQUE INLET,	5	12½
Crests,	11	28,	HEIGHT RIGHT PELVIC WALL,	4	10
External Conjugate,	7	18	HEIGHT LEFT PELVIC WALL,	4	10
RIGHT EXTERNAL OBLIQUE,	8¾	22	HEIGHT POSTERIOR PELVIC WALL,	5	12½
LEFT EXTERNAL OBLIQUE	8¾	22	LENGTH SACRO-COCCYGEAL CURVE	5½	13
Height of Symphysis,	2½	6	TRANSVERSE OUTLET,	5¼	13½
DIAGONAL CONJUGATE,	5⅛	13	ANTERO-POSTERIOR OUTLET (COCCYGEAL),	3½	9
ANATOMICAL CONJUGATE,	5	12½	ANTERO-POSTERIOR OUTLET (SACRAL),	4½	11½
Obstetric Conjugate,	4½	11	CURVE OF SACRUM,	FLATTENED	
5			PUBIC ANGLE	115°	

GROUP VI.—RHACHITIC PELVIS WITH ENLARGEMENT OF THE BONES. ADULT EIGHTEEN YEARS OLD. (DUPUYTREN MUSEUM.)

(¼ natural size.)

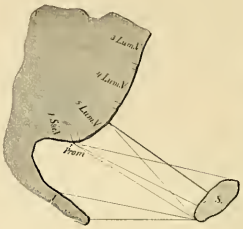


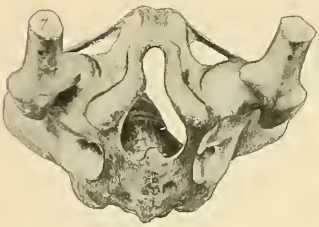


MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	21	53½	TRANSVERSE OF INLET,	4¼	11
TROCHANTERS.	11	28	RIGHT OBLIQUE INLET,	4½	11½
Spines,	10¾	27½	LEFT OBLIQUE INLET,	4¼	11
Crests,	10½	26½	HEIGHT RIGHT PELVIC WALL,	3⅝	9
External Conjugate,	5¼	13½	HEIGHT LEFT PELVIC WALL,	3½	9
RIGHT EXTERNAL OBLIQUE,	8	20½	HEIGHT POSTERIOR PELVIC WALL,	3⅞	10
LEFT EXTERNAL OBLIQUE,	7¾	20	LENGTH SACRO-COCCYGEAL CURVE	5	12½
Height of Symphysis,	1¾	4½	TRANSVERSE OUTLET,	4	10
DIAGONAL CONJUGATE,	3½	9	ANTERO-POSTERIOR OUTLET (COCCYGEAL),	3¼	8½
ANATOMICAL CONJUGATE,	3	7½	ANTERO-POSTERIOR OUTLET (SACRAL),	4	10
Obstetric Conjugate,	2½	6½	CURVE OF SACRUM,	INCREASED	
6			PUBIC ANGLE	113°	

GROUP VII.—RHACHITIC PELVIS WITH SLIGHT CONTRACTION OF THE PELVIC INLET AND MARKED CONTRACTION OF OUTLET. LATERAL DEVIATION OF THE PROMONTORY TO THE LEFT. ADULT. (DUPUYTREN MUSEUM.)

(¼ natural size.)

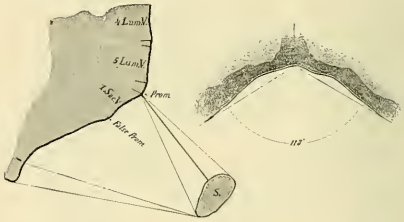




MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	21	53½	TRANSVERSE OF INLET,	4	10
TROCHANTERS,	8⅞	22	RIGHT OBLIQUE INLET	4	10
Spines,	8	20½	LEFT OBLIQUE INLET	4	10
Crests,	9	23	HEIGHT RIGHT PELVIC WALL.	3½	9
External Conjugate.	7	18	HEIGHT LEFT PELVIC WALL.	3½	9
RIGHT EXTERNAL OBLIQUE,	7½	19	HEIGHT POSTERIOR PELVIC WALL.	2⅜	6
LEFT EXTERNAL OBLIQUE	7	18	LENGTH SACRO-COCCYGEAL CURVE	4½	11
Height of Symphysis.	1½	4	TRANSVERSE OUTLET	2½	6½
DIAGONAL CONJUGATE.	4⅛	10½	ANTERO-POSTERIOR OUTLET (COCCYGEAL)	3	7½
ANATOMICAL CONJUGATE.	4⅝	12	ANTERO-POSTERIOR OUTLET (SACRAL)	4	10
Obstetric Conjugate,	4	10	CURVE OF SACRUM,	INCREASED	
?			PUBIC ANGLE	27°	

GROUP VIII.—DEFORMED PELVIS WITH CONTRACTION OF THE PELVIC INLET AND WIDENING OF THE PELVIC OUTLET. ADULT. FALSE PROMONTORY. (DUPUYTREN MUSEUM.)

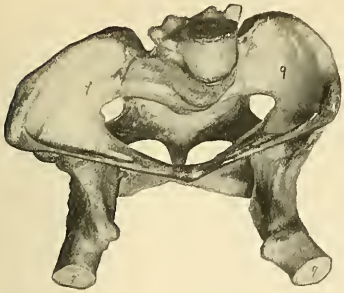
(¼ natural size.)

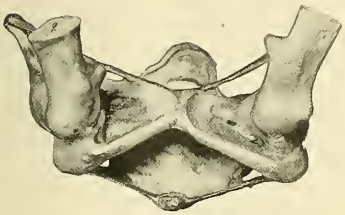


MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	21¾	55½	TRANSVERSE OF INLET,	5	12½
TROCHANTERS,	11	28	RIGHT OBLIQUE INLET,	4½	11½
Spines,	9½	24	LEFT OBLIQUE INLET,	4⅓	11
Crests,	10¼	26	HEIGHT RIGHT PELVIC WALL.	4	10
External Conjugate.	6¼	16	HEIGHT LEFT PELVIC WALL.	3¾	9½
RIGHT EXTERNAL OBLIQUE,	8	20½	HEIGHT POSTERIOR PELVIC WALL.	4⅜	11
LEFT EXTERNAL OBLIQUE	8	20½	LENGTH SACRO-COCCYGEAL CURVE	4½	11½
Height of Symphysis.	1½	4	TRANSVERSE OUTLET,	5	12½
DIAGONAL CONJUGATE.	4	10	ANTERO-POSTERIOR OUTLET (COCCYGEAL).	5½	14
ANATOMICAL CONJUGATE.	3½	9	ANTERO-POSTERIOR OUTLET (SACRAL).	5⅜	13½
Obstetric Conjugate.	3¼	8½	CURVE OF SACRUM,	FLATTENED	
8			PUBIC ANGLE	118°	

GROUP IX.—DEFORMED PELVIS. DRIVING IN OF THE ILIUMS. CORDIFORM SHAPE OF THE PELVIC INLET. FALSE PROMONTORY.

(¼ natural size.)

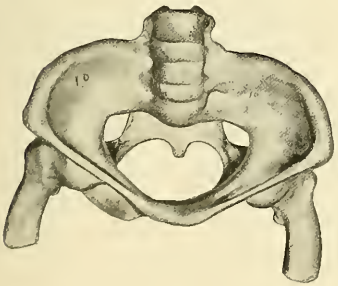


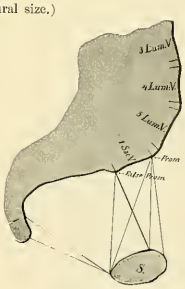


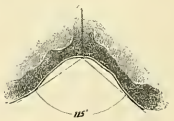
MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	18	46	TRANSVERSE OF INLET,	5	12½
TROCHANTERS,	6¾	17	RIGHT OBLIQUE INLET.	4	10
Spines,	9	23	LEFT OBLIQUE INLET.	4½	11
Crests,	7¼	18½	HEIGHT RIGHT PELVIC WALL.	3¼	8½
External Conjugata,	4	10	HEIGHT LEFT PELVIC WALL.	3½	8½
RIGHT EXTERNAL OBLIQUE.	6¾	17	HEIGHT POSTERIOR PELVIC WALL.	4⅜	11
LEFT EXTERNAL OBLIQUE	8½	21½	LENGTH SACRO-COCCYGEAL CURVE	5	12½
Height of Symphysis,	1¼	3	TRANSVERSE OUTLET.	5	12½
DIAGONAL CONJUGATE	3⅛	8½	ANTERO-POSTERIOR OUTLET (COCCYGEAL).	2	5
ANATOMICAL CONJUGATE.	2⅛	5½	ANTERO-POSTERIOR OUTLET (SACRAL).	2	5
Obstetric Conjugate,	1½	4	CURVE OF SACRUM.	FLATTENED	
9			PUBIC ANGLE	117°	

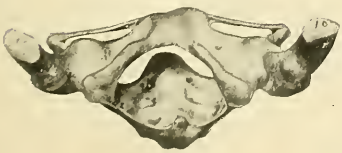
GROUP X.—RHACHITIC PELVIS. JUTTING FORWARD OF THE SACRUM. SHORTENING OF THE ANTERO-POSTERIOR DIAMETERS OF THE TRUE PELVIS. FALSE PROMONTORY. (DUPUYTREN MUSEUM.)

(¼ natural size.)





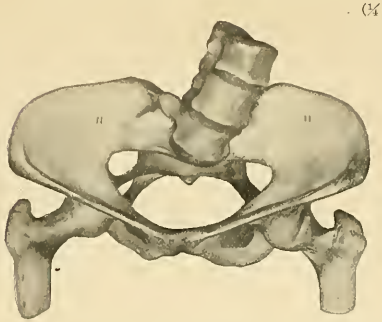


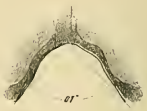


MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	20½	52	TRANSVERSE OF INLET,	4½	11½
TROCHANTERS.	10	25½	RIGHT OBLIQUE INLET,	4½	11½
Spines,	9½	24	LEFT OBLIQUE INLET.	4¼	11
Crests,	8¾	22	HEIGHT RIGHT PELVIC WALL.	3½	9
External Conjugate,	5⅜	13½	HEIGHT LEFT PELVIC WALL.	3½	9
RIGHT EXTERNAL OBLIQUE.	7¼	18½	HEIGHT POSTERIOR PELVIC WALL.	4¼	11
LEFT EXTERNAL OBLIQUE	7¼	18½	LENGTH SACRO-COCCYGEAL CURVE	5¼	13½
Height of Symphysis.	1½	4	TRANSVERSE OUTLET.	3½	9
DIAGONAL CONJUGATE.	3½	9	ANTERO-POSTERIOR OUTLET (COCCYGEAL).	2¾	7
ANATOMICAL CONJUGATE.	3	7½	ANTERO-POSTERIOR OUTLET (SACRAL)	3½	9½
Obstetric Conjugate,	2¾	7	CURVE OF SACRUM.	FLATTENED	
10			PUBIC ANGLE	115°	

GROUP XI.—RHACHITIC PELVIS. JUTTING FORWARD OF THE SACRAL PROMONTORY. ANTERO-POSTERIOR FLATTENING OF THE INLET. LATERAL FLATTENING OF THE OUTLET. CORDIFORM SHAPE OF THE PELVIC INLET. ADULT. FALSE PROMONTORY.

(¼ natural size.)

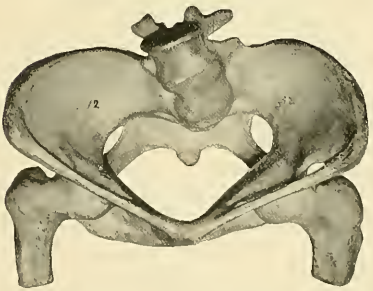


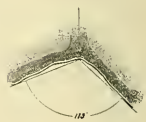


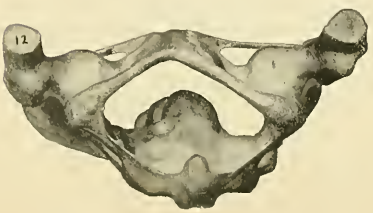
MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	19¾	50	TRANSVERSE OF INLET,	5	12½
TROCHANTERS,	10¾	27½	RIGHT OBLIQUE INLET,	4	10
Spines,	10¾	27½	LEFT OBLIQUE INLET	4½	11
Crests,	10¼	26	HEIGHT RIGHT PELVIC WALL.	3½	9
External Conjugate,	5	12½	HEIGHT LEFT PELVIC WALL,	3½	9
RIGHT EXTERNAL OBLIQUE.	7¼	18½	HEIGHT POSTERIOR PELVIC WALL.	4¾	12
LEFT EXTERNAL OBLIQUE.	7½	19	LENGTH SACRO-COCCYGEAL CURVE	5	12½
Height of Symphysis,	1⅜	3½	TRANSVERSE OUTLET.	3½	9
DIAGONAL CONJUGATE.	3¾	8½	ANTERO-POSTERIOR OUTLET (COCCYGEAL).	4	10
ANATOMICAL CONJUGATE.	2⅜	3½	ANTERO-POSTERIOR OUTLET (SACRAL).	3½	9
Obstetric Conjugate,	2	5	CURVE OF SACRUM,		FLATTENED
11			PUBIC ANGLE		87°

GROUP XII.—RHACHITIC PELVIS. LATERAL DEVIATION OF THE SACRUM TO THE LEFT. SINKING IN OF THE ILIUM OF THE CORRESPONDING SIDE. SHORTENING OF THE RIGHT OBLIQUE DIAMETER OF THE PELVIC INLET. ADULT. FALSE PROMONTORY. (DUPUYTREN MUSEUM.)

(¼ natural size.)



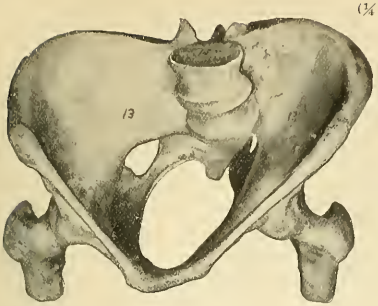




MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	20	51	TRANSVERSE OF INLET,	4¾	12
TROCHANTERS,	10¼	26	RIGHT OBLIQUE INLET,	3½	9
Spines,	9¼	23½	LEFT OBLIQUE INLET,	4¼	11
Crests,	9⅜	23	HEIGHT RIGHT PELVIC WALL.	3¼	8½
External Conjugate,	6	15	HEIGHT LEFT PELVIC WALL,	3	7½
RIGHT EXTERNAL OBLIQUE,	7¼	18½	HEIGHT POSTERIOR PELVIC WALL.	4⅜	10½
LEFT EXTERNAL OBLIQUE	8	20½	LENGTH SACRO-COCCYGEAL CURVE	5¼	13½
Height of Symphysis,	1¾	4½	TRANSVERSE OUTLET.	5½	14
DIAGONAL CONJUGATE.	4¼	11	ANTERO-POSTERIOR OUTLET (COCCYGEAL).	3	7½
ANATOMICAL CONJUGATE.	3⅜	8	ANTERO-POSTERIOR OUTLET (SACRAL).	4⅜	10½
Obstetric Conjugate,	3	7½	CURVE OF SACRUM,		FLATTENED
12			PUBIC ANGLE		113°

GROUP XIII.—OVAL OBLIQUE PELVIS OF NAEGELE.

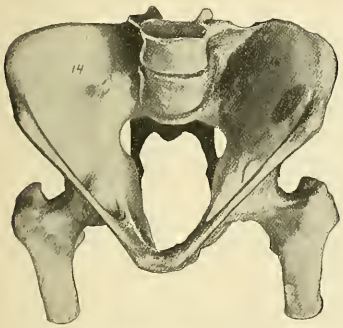
(¼ natural size.)

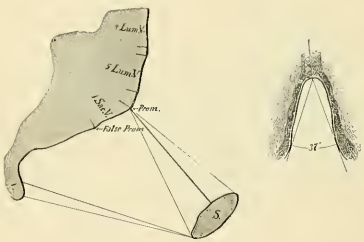


MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	20⅜	50¼	TRANSVERSE OF INLET,	4¼	11
TROCHANTERS,	10½	26½	RIGHT OBLIQUE INLET,	3⅛	8
Spines,	8⅞	22½	LEFT OBLIQUE INLET,	3	12½
Crests,	10	25½	HEIGHT RIGHT PELVIC WALL,	4½	11½
External Conjugate,	7½	19	HEIGHT LEFT PELVIC WALL,	4½	11
RIGHT EXTERNAL OBLIQUE,	6¾	17	HEIGHT POSTERIOR PELVIC WALL,	4⅜	11
LEFT EXTERNAL OBLIQUE,	7⅜	19	LENGTH SACRO-COCCYGEAL CURVE	5¼	13½
Height of Symphysis,	1¾	4½	TRANSVERSE OUTLET,	3	7½
DIAGONAL CONJUGATE,	4⅝	12	ANTERO-POSTERIOR OUTLET (COCCYGEAL),	4¼	11
ANATOMICAL CONJUGATE,	4½	11½	ANTERO-POSTERIOR OUTLET (SACRAL),	4¾	12
Obstetric Conjugate,	4⅛	10½	CURVE OF SACRUM,	FLATTENED	
13			PUBIC ANGLE	70°	

GROUP XIV.—DEFORMED PELVIS WITH CONSIDERABLE SHORTENING OF THE TRANSVERSE DIAMETER. JUTTING FORWARD OF THE SACRAL PROMONTORY. FALSE PROMONTORY.

(¼ natural size.)

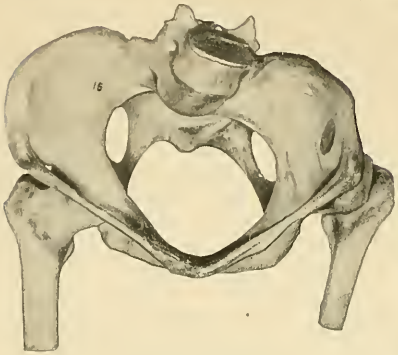




MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	18¾	47½	TRANSVERSE OF INLET,	3⅛	8
TROCHANTERS,	9½	24	RIGHT OBLIQUE INLET,	3½	9
Spines,	7⅞	20	LEFT OBLIQUE INLET,	3½	9
Crests,	8¾	22	HEIGHT RIGHT PELVIC WALL,	4	10
External Conjugate,	6⅝	16½	HEIGHT LEFT PELVIC WALL,	4	10
RIGHT EXTERNAL OBLIQUE,	7⅛	18	HEIGHT POSTERIOR PELVIC WALL,	4⅛	10½
LEFT EXTERNAL OBLIQUE,	7⅛	18	LENGTH SACRO-COCCYGEAL CURVE	4¾	12
Height of Symphysis,	1⅝	4	TRANSVERSE OUTLET,	1¾	4½
DIAGONAL CONJUGATE,	4	10	ANTERO-POSTERIOR OUTLET (COCCYGEAL),	5⅛	13
ANATOMICAL CONJUGATE,	3⅞	10	ANTERO-POSTERIOR OUTLET (SACRAL),	5½	14
Obstetric Conjugate,	3½	9	CURVE OF SACRUM,	FLATTENED	
14			PUBIC ANGLE	37°	

GROUP XV.—PELVIS DEFORMED BY CONGENITAL DISLOCATION OF ONE FEMUR.

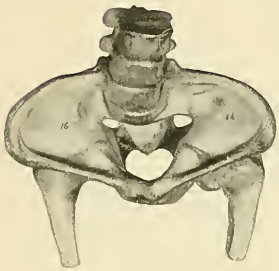
(¼ natural size.)



MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	24½	62	TRANSVERSE OF INLET,	5	12¾
TROCHANTERS,	12	30½	RIGHT OBLIQUE INLET,	5½	14
Spines,	10	25½	LEFT OBLIQUE INLET,	4½	11½
Crests,	9¾	25	HEIGHT RIGHT PELVIC WALL.	4	10
External Conjugate,	7⅜	18	HEIGHT LEFT PELVIC WALL.	3	7½
RIGHT EXTERNAL OBLIQUE.	8⅜	20¾	HEIGHT POSTERIOR PELVIC WALL.	3½	9
LEFT EXTERNAL OBLIQUE.	8½	21½	LENGTH SACRO-COCCYGEAL CURVE	5	12½
Height of Symphysis,	1¾	4½	TRANSVERSE OUTLET.	5	12½
DIAGONAL CONJUGATE.	5½	13½	ANTERO-POSTERIOR OUTLET (COCCYGEAL).	4	10
ANATOMICAL CONJUGATE.	4⅝	12	ANTERO-POSTERIOR OUTLET (SACRAL).	5¼	13½
Obstetric Conjugate,	4⅜	11	CURVE OF SACRUM,	INCREASED	
15			PUBIC ANGLE.	114°	

GROUP XVI.—RHACHITIC PELVIS. CHILD.

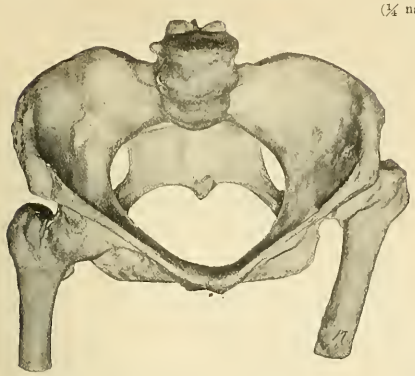
(¼ natural size.)

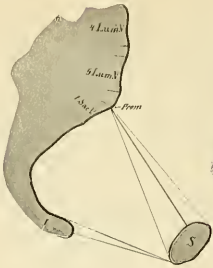


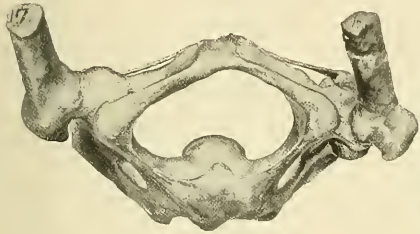
MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE.	14	35½	TRANSVERSE OF INLET,	2⅛	5½
TROCHANTERS.	6¾	17	RIGHT OBLIQUE INLET	2⅜	6
Spines,	7⅛	18	LEFT OBLIQUE INLET,	2⅜	6
Crests,	6¾	17	HEIGHT RIGHT PELVIC WALL.	3	7½
External Conjugate,	3¾	9½	HEIGHT LEFT PELVIC WALL.	3	7½
RIGHT EXTERNAL OBLIQUE.	5½	14	HEIGHT POSTERIOR PELVIC WALL.	2	5
LEFT EXTERNAL OBLIQUE	5⅝	14½	LENGTH SACRO-COCCYGEAL CURVE	3	7½
Height of Symphysis.	1⅜	3½	TRANSVERSE OUTLET.	1¾	5
DIAGONAL CONJUGATE.	2½	6½	ANTERO-POSTERIOR OUTLET (COCCYGEAL).	1½	4
ANATOMICAL CONJUGATE.	1¾	4½	ANTERO-POSTERIOR OUTLET (SACRAL).	2⅜	5½
Obstetric Conjugate,	1½	4	CURVE OF SACRUM.	INCREASED	
16			PUBIC ANGLE	65°	

GROUP XVII.—PELVIS DEFORMED BY SPONTANEOUS DISLOCATION OF THE LEFT FEMUR.

(¼ natural size.)



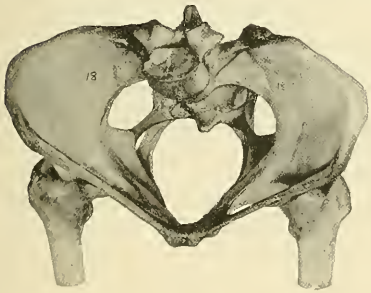


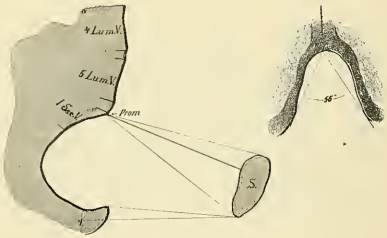


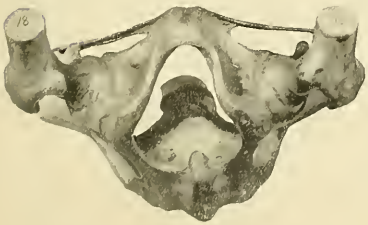
MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	24	61	TRANSVERSE OF INLET,	5	12½
TROCHANTERS,	11⅞	30	RIGHT OBLIQUE INLET,	5	12½
Spines,	9½	25	LEFT OBLIQUE INLET,	4½	11½
Crests,	10¼	26	HEIGHT RIGHT PELVIC WALL,	4⅝	12
External Conjugate,	6½	16½	HEIGHT LEFT PELVIC WALL,	4½	11½
RIGHT EXTERNAL OBLIQUE,	8½	21½	HEIGHT POSTERIOR PELVIC WALL,	3¾	9½
LEFT EXTERNAL OBLIQUE,	8½	21½	LENGTH SACRO-COCCYGEAL CURVE,	5½	14
Height of Symphysis,	1⅜	3½	TRANSVERSE OUTLET,	5½	14½
DIAGONAL CONJUGATE,	4⅞	12¼	ANTERO-POSTERIOR OUTLET (COCCYGEAL),	3⅞	7½
ANATOMICAL CONJUGATE,	4½	11½	ANTERO-POSTERIOR OUTLET (SACRAL),	4¾	11
Obstetric Conjugate,	4⅛	10½	CURVE OF SACRUM,		INCREASED
			PUBIC ANGLE		111°

GROUP XVIII.—PELVIS DEFORMED BY OSTEOMALACIA. SLIGHT DEGREE. ADULT. (DUPUYTREN MUSEUM.)

(¼ natural size.)



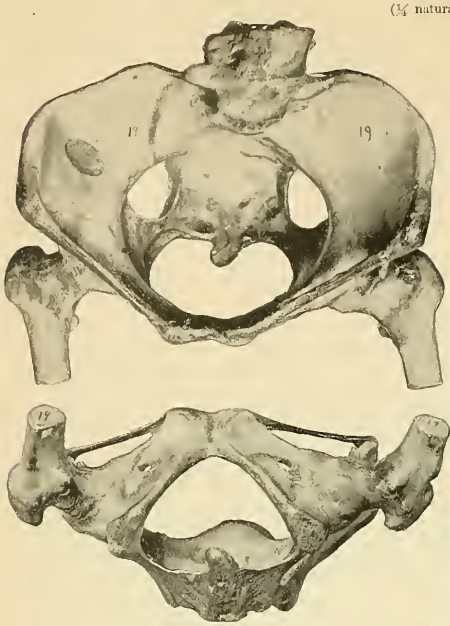


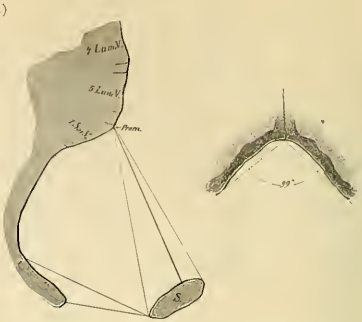


MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	22⅞	58	TRANSVERSE OF INLET,	5½	14
TROCHANTERS,	10¾	27½	RIGHT OBLIQUE INLET,	5	12¾
Spines,	9¾	25	LEFT OBLIQUE INLET,	4⅞	12¾
Crests,	10¾	27½	HEIGHT RIGHT PELVIC WALL,	4⅝	12
External Conjugate,	7¼	18½	HEIGHT LEFT PELVIC WALL,	4⅝	12
RIGHT EXTERNAL OBLIQUE,	8¼	21	HEIGHT POSTERIOR PELVIC WALL,	3¾	9½
LEFT EXTERNAL OBLIQUE,	8¼	21	LENGTH SACRO-COCCYGEAL CURVE,	5	12¾
Height of Symphysis,	1¾	4½	TRANSVERSE OUTLET,	3⅝	9
DIAGONAL CONJUGATE,	4⅝	12	ANTERO-POSTERIOR OUTLET (COCCYGEAL),	3½	9
ANATOMICAL CONJUGATE,	4⅜	11	ANTERO-POSTERIOR OUTLET (SACRAL),	4⅜	11
Obstetric Conjugate,	4	10	CURVE OF SACRUM,		INCREASED
			PUBIC ANGLE		56°

GROUP XIX.—DEFORMED PELVIS. FUNNEL-SHAPED ENLARGEMENT OF THE PELVIC INLET. CONTRACTION OF PELVIC OUTLET. (DUPUYTREN MUSEUM.)

(¼ natural size.)

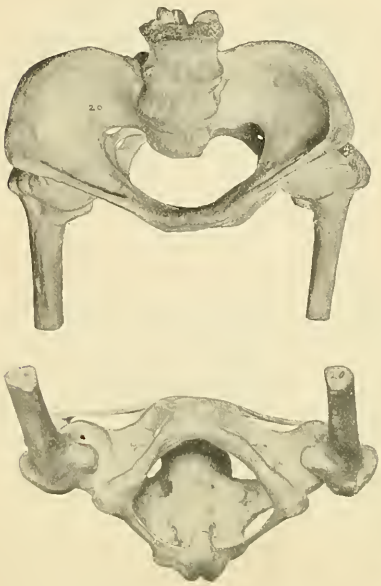


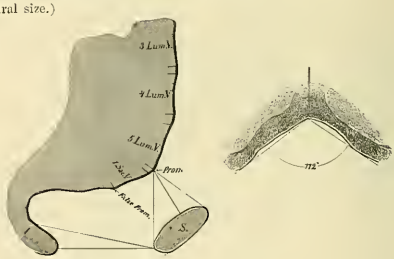


MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	25½	65	TRANSVERSE OF INLET,	5⅜	15
TROCHANTERS,	12¼	31	RIGHT OBLIQUE INLET,	5¼	13½
Spines,	10¼	26	LEFT OBLIQUE INLET,	5½	14
Crests,	10¾	27½	HEIGHT RIGHT PELVIC WALL,	3¾	9½
External Conjugate,	7⅞	20	HEIGHT LEFT PELVIC WALL,	3½	9½
RIGHT EXTERNAL OBLIQUE,	8¾	22	HEIGHT POSTERIOR PELVIC WALL,	5½	14
LEFT EXTERNAL OBLIQUE,	9	23	LENGTH SACRO-COCCYGEAL CURVE	7¼	18½
Height of Symphysis,	2	5	TRANSVERSE OUTLET,	4	10
DIAGONAL CONJUGATE,	6	15	ANTERO-POSTERIOR OUTLET (COCCYGEAL),	2¾	7
ANATOMICAL CONJUGATE,	5½	14	ANTERO-POSTERIOR OUTLET (SACRAL),	4⅜	11
Obstetric Conjugate,	5¼	13½	CURVE OF SACRUM,	MODERATE	
19			PUBIC ANGLE	99°	

GROUP XX.—RHACHITIC PELVIS. OBSTETRIC CONJUGATE OF THE PELVIC INLET, FOUR CENTIMETRES. FALSE PROMONTORY. CÆSAREAN SECTION PERFORMED.

(¼ natural size.)

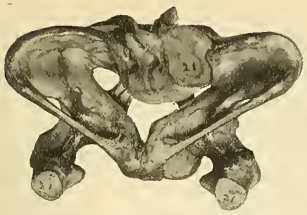




MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	20	51	TRANSVERSE OF INLET,	4½	11½
TROCHANTERS,	10½	27½	RIGHT OBLIQUE INLET,	4	10
Spines,	9	23	LEFT OBLIQUE INLET,	3⅜	9
Crests,	8⅞	22¼	HEIGHT RIGHT PELVIC WALL,	2⅜	6½
External Conjugate,	5	12½	HEIGHT LEFT PELVIC WALL,	2⅜	6½
RIGHT EXTERNAL OBLIQUE,	6¾	17	HEIGHT POSTERIOR PELVIC WALL,	3½	9
LEFT EXTERNAL OBLIQUE,	7⅛	18	LENGTH SACRO-COCCYGEAL CURVE	5¼	13½
Height of Symphysis,	1⅝	4½	TRANSVERSE OUTLET,	4¼	11
DIAGONAL CONJUGATE,	2⅜	6	ANTERO-POSTERIOR OUTLET (COCCYGEAL),	2¾	7
ANATOMICAL CONJUGATE,	1⅞	5	ANTERO-POSTERIOR OUTLET (SACRAL),	4⅛	10½
Obstetric Conjugate,	1½	4	CURVE OF SACRUM,	FLATTENED	
20			PUBIC ANGLE	112°	

GROUP XXI.—RHACHITIC PELVIS. OBSTETRIC CONJUGATE, FOUR CENTIMETRES AND A HALF CÆSAREAN SECTION PERFORMED.

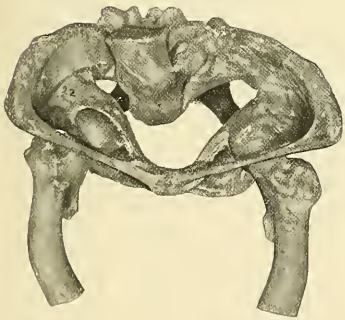
(¼ natural size.)

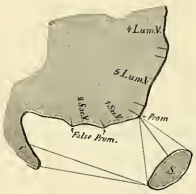


MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	20½	52	TRANSVERSE OF INLET,	2¾	7
TROCHANTERS,	8⅞	22	RIGHT OBLIQUE INLET,	3⅜	9
Spines,	8¾	22	LEFT OBLIQUE INLET,	3⅜	8½
Crests,	10¼	26	HEIGHT RIGHT PELVIC WALL,	3	7½
External Conjugate.	6⅜	16	HEIGHT LEFT PELVIC WALL,	3¼	8
RIGHT EXTERNAL OBLIQUE,	6¾	17	HEIGHT POSTERIOR PELVIC WALL,	2½	5½
LEFT EXTERNAL OBLIQUE,	7⅛	18	LENGTH SACRO-COCCYGEAL CURVE	5¼	13½
Height of Symphysis,	2¾	7	TRANSVERSE OUTLET,	2¾	7
DIAGONAL CONJUGATE,	2¾	7	ANTERO-POSTERIOR OUTLET (COCCYGEAL)	2¾	7
ANATOMICAL CONJUGATE,	3	7½	ANTERO-POSTERIOR OUTLET (SACRAL)	4¾	12
Obstetric Conjugate,	1¾	4½	CURVE OF SACRUM,	INCREASED	
21			PUBIC ANGLE	45°	

GROUP XXII.—RHACHITIC PELVIS. OBSTETRIC CONJUGATE, FOUR CENTIMETRES. FALSE PROMONTORIES. CÆSAREAN SECTION PERFORMED.

(¼ natural size.)



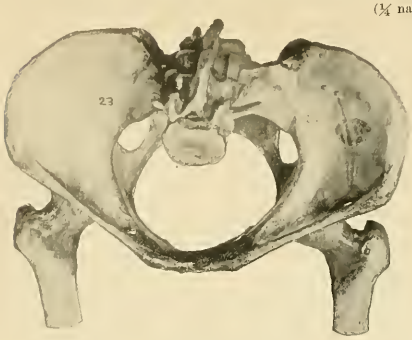


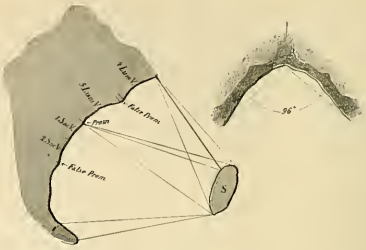
MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	20	51	TRANSVERSE OF INLET,	3½	9
TROCHANTERS,	9½	23½	RIGHT OBLIQUE INLET,	4⅛	10½
Spines,	9	23	LEFT OBLIQUE INLET,	4	10
Crests,	8¼	21	HEIGHT RIGHT PELVIC WALL,	3¼	8½
External Conjugate,	5	12½	HEIGHT LEFT PELVIC WALL,	3½	9½
RIGHT EXTERNAL OBLIQUE,	3⅛	20½	HEIGHT POSTERIOR PELVIC WALL,	5½	14
LEFT EXTERNAL OBLIQUE,	7⅞	20	LENGTH SACRO-COCCYGEAL CURVE	5¼	13½
Height of Symphysis,	1½	4	TRANSVERSE OUTLET,	4¾	10
DIAGONAL CONJUGATE,	2⅛	5½	ANTERO-POSTERIOR OUTLET (COCCYGEAL),	3¼	8½
ANATOMICAL CONJUGATE,	1⅜	3	ANTERO-POSTERIOR OUTLET (SACRAL),	3¾	10
Obstetric Conjugate,	1½	4	CURVE OF SACRUM,	INCREASED	
22			PUBIC ANGLE.	112°	

GROUP XXIII.—DEFORMED PELVIS. FALSE PROMONTORIES. (HERGOTT.)

Vide Farabeuf, M., Spondyloschise, Spondylolisthèse and Spondylizème. *Bulletins de la Société de chirurgie, 1885.*

(¼ natural size.)

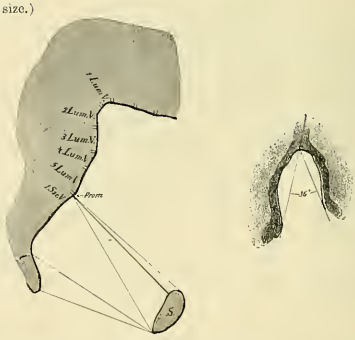




MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	23	58½	TRANSVERSE OF INLET,	5¼	13½
TROCHANTERS,	11½	29	RIGHT OBLIQUE INLET,	4⅞	12½
Spines,	10¼	26	LEFT OBLIQUE INLET,	5⅛	13
Crests,	11	28	HEIGHT RIGHT PELVIC WALL,	3¾	9½
External Conjugate,	6⅞	17½	HEIGHT LEFT PELVIC WALL,	3¾	9½
RIGHT EXTERNAL OBLIQUE,	8¾	22	HEIGHT POSTERIOR PELVIC WALL,	3½	9
LEFT EXTERNAL OBLIQUE,	9	23	LENGTH SACRO-COCCYGEAL CURVE	4½	11½
Height of Symphysis,	1½	4	TRANSVERSE OUTLET,	5	12¾
DIAGONAL CONJUGATE,	5	12¾	ANTERO-POSTERIOR OUTLET (COCCYGEAL),	4½	11½
ANATOMICAL CONJUGATE,	4¾	12	ANTERO-POSTERIOR OUTLET (SACRAL),	5	12¾
Obstetric Conjugate,	3½	9	CURVE OF SACRUM,	FLATTENED	
23			PUBIC ANGLE	96°	

GROUP XXIV.—DEFORMED PELVIS. (GUICHARD, OF NANTES.)

(¼ natural size.)



MEASUREMENTS	INS.	CM.	MEASUREMENTS	INS.	CM.
CIRCUMFERENCE,	19	48½	TRANSVERSE OF INLET,	3⅝	9
TROCHANTERS,	9⅜	24	RIGHT OBLIQUE INLET,	4½	11½
Spines,	9¼	23½	LEFT OBLIQUE INLET,	3⅝	9
Crests,	9½	24	HEIGHT RIGHT PELVIC WALL,	2¾	7
External Conjugate,	6½	16½	HEIGHT LEFT PELVIC WALL,	3¼	8½
RIGHT EXTERNAL OBLIQUE,	7½	18½	HEIGHT POSTERIOR PELVIC WALL,	3⅜	8
LEFT EXTERNAL OBLIQUE,	6⅜	16	LENGTH SACRO-COCCYGEAL CURVE	3½	9
Height of Symphysis,	1⅜	3½	TRANSVERSE OUTLET,	2¼	6
DIAGONAL CONJUGATE,	4⅝	12	ANTERO-POSTERIOR OUTLET (COCCYGEAL),	3¾	9½
ANATOMICAL CONJUGATE,	4⅜	10½	ANTERO-POSTERIOR OUTLET (SACRAL),	4½	11
Obstetric Conjugate,	4	10	CURVE OF SACRUM,	FLATTENED	
24			PUBIC ANGLE	36°	

AIDS IN OBSTETRIC TEACHING.

PART III.

IV. *Miscellaneous Models and Aids.*

A FEW metal and leather models, not classifiable under the other divisions of aids, I place under this heading.

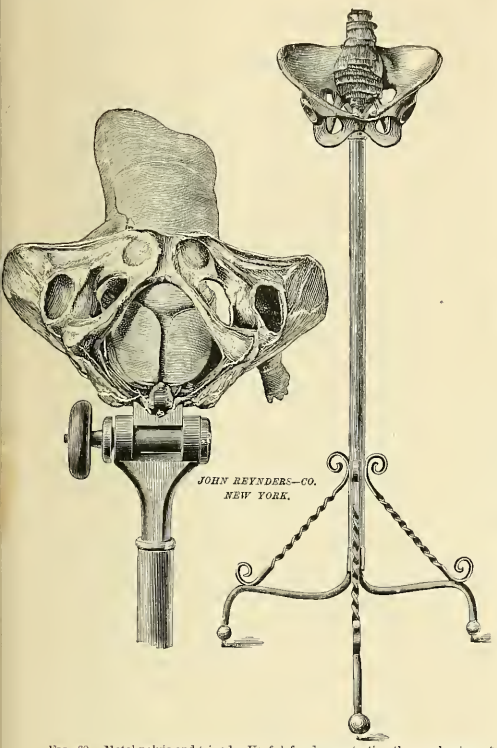


FIG. 60.—Metal pelvis and tripod. Useful for demonstrating the mechanism of labor and obstetric operations. (From a photograph.)

1. *Aluminum Cast of Sagittal Mesial Section of Bony Pelvis.**—The first that we have to offer is a vertical mesial section of the female bony pelvis, cast in aluminum and mounted by means of a hand screw upon a blackboard, and the whole set in a tripod. By means of a narrow nickel band the right half of the pelvic brim is completed, so that the pelvic inlet shows a continuous line without a break. Rotation on a transverse axis allows us, by means of the hand screw, to place the pelvis in the position corresponding to the dorsal and upright ones, or at any intermediate angle (see Fig. 1).

Below the aluminum cast I have outlined permanently in white upon the board a vertical mesial section of the female bony pelvis, in the position corresponding to the dorsal one, and with the diameters and axes of the bony inlet and outlet and the axis of the parturient outlet added; such a combined blackboard and working model, we believe, has never been offered before, and without using it one can scarcely imagine the manifold and varied uses to which such a combination may be put, as the invention is equally useful in gynæcological as well as obstetrical demonstrations.

* Made by the John Reynders Company, New York.

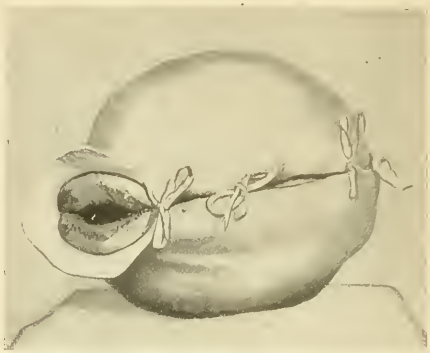


FIG. 61.—Leather model of the puerperal uterus, with double laceration of the cervix and opening at one side closed by tapes. Useful for many demonstrations. (From a photograph.) See Figs. 7 and 8.

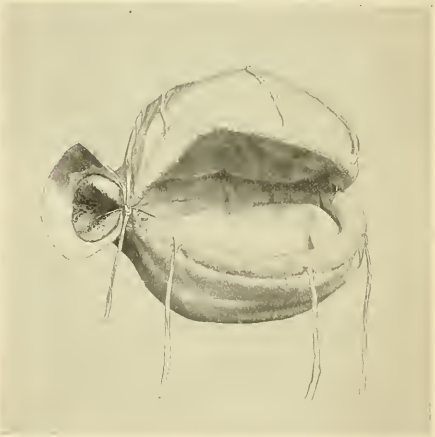


FIG. 62.—Leather model of puerperal uterus, showing interior. (From a photograph.)

With a supply of puppets, models of uteri, and colored chalk at our disposal, there is scarcely an obstetric or gynæcological condition that will not admit of a concise ocular demonstration.

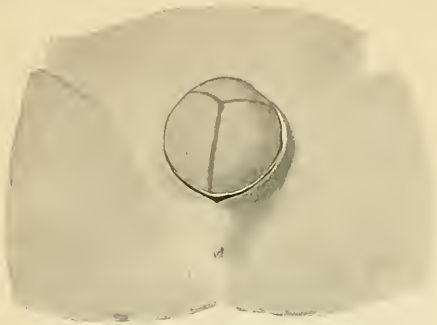


Fig. 63.—Reproduction in rubber of a plaster cast, taken from Nature, of the buttocks and vulva. Useful for demonstrating the mechanism and management of the second stage of labor. (From a photograph.)

The metal pelvis (Fig. 70) can, with advantage, be used, in conjunction with the present sagittal section of the pelvis, in many ways that will readily suggest themselves to the demonstrator. If desired, the same tripod will answer for both contrivances.

Fig. 64.—External genital organs. Nullipara. From cadaver. (Copper-plated plaster cast; from a photograph.)

Fig. 1 shows the model and blackboard mounted upon the tripod, and Figs. 2 to 6 indicate a few of the many ocular demonstrations that may be given with it.

2. *Complete Metal Pelvis.**—The complete metal pelvis, mounted upon a tripod, has already been described and figured in a paper upon obstetric manikins * but I take the opportunity of reproducing it here (Fig. 60).

Its utility is attested by the fact, as the instrument maker informs us, that it has been supplied to many of the medical schools of this country and Canada.†

3. *Leather Model of Puerperal Uterus.*‡—Such a simple and inexpensive model as that depicted in Fig. 61

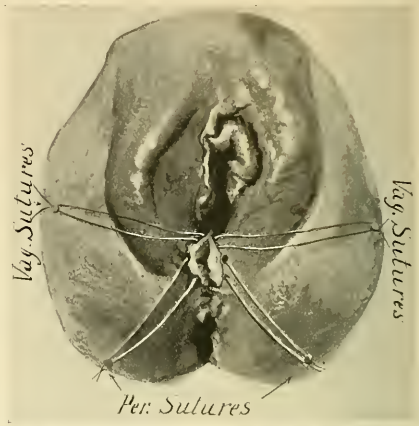


Fig. 65.—Vagino-perineal laceration involving the right lateral sulcus. Two internal, or vaginal, and two external, or perineal, sutures in place ready to be tied. (Copper-plated plaster cast; from a photograph.)

can readily be made to do duty in various kinds of demonstration. It is constructed of chamois leather, lined with canvas, and may be opened along one lateral half, the opening being closed with tapes (Fig. 62).

* *Ibid*

* Edgar. The Manikin in the teaching of Practical Obstetrics. *New York Medical Journal*, December 27, 1890.

† The following is the original description: For demonstrating the mechanism of labor before a large class—the application of the forceps, cranioclast, cephalotribe, and other obstetric instruments; the various methods of performing version; the different methods of manual extraction, whether by the head, shoulders, breech, or lower extremities—the gun-metal pelvis, covered with leather and mounted upon a tripod, has proved itself exceedingly useful (Fig. 60).

The pelvis is practically indestructible, and is so mounted (Fig. 60) upon the upright of a tripod as to permit of rotation in an entire circle in a horizontal plane, which allows the pelvic outlet or inlet to be directed to any point desired.

Besides complete rotation in the plane of the horizon, partial rotation upon a transverse axis is also easily and quickly secured, and a simple device (Fig. 60), in the shape of a small wheel at the side, enables one to fix the planes of the pelvis (represented by cardboard if need be) at any desired angle with the horizon.

If desirable, for greater convenience and accuracy, a simple scale may be added at the side, which will enable one to read off at a glance the angle produced. A movable coccyx permits recession during the passage of the fœtus, and a spring throws it back again to its true position. A false sacrum, controlled by a thumbscrew passing through the true sacrum, enables one to illustrate contraction of the pelvis in its antero-posterior diameter, or to fix the presenting part of the puppet or fœtal cadaver in any desired position.

‡ Made by the John Reynders Company, New York.

The cuff of the partly cut away vagina is represented by a piece of leather, and the cervix made to show a bilateral laceration, extending in each instance as far as the uterovaginal junction.

The whole roughly resembles the puerperal uterus at the beginning of the puerperium.

This uterus can be utilized in a variety of ways: alone to show manual expression of the placenta; in conjunction with the metal pelves to demonstrate the axis of the puerperal uterus and puerperal canal and Credé's method of placental expression, or with any ordinary manikin, to illustrate the technics of various puerperal obstetric procedures. With this simple model, together with some gauze, volsella forceps, dressing forceps, needles, ligatures, curettes, and a speculum, the student may be made familiar with that manual training necessary to ligate the bleeding points in a deeply lacerated cervix; to pack safely the puerperal uterus with gauze to control hæmorrhage or secure drainage; to use properly the puerperal curette, so as to reach safely the fundus with the cautious upstroke, and to clear it of *débris* with the more forcible clean downward sweep, not neglecting to clear the cornua at the same time.

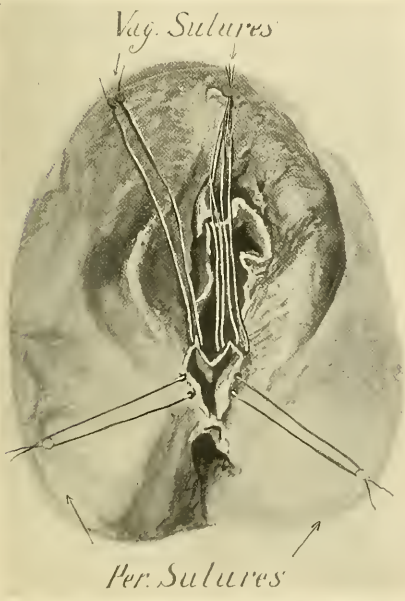


FIG. 66.—Vagino-perineal laceration involving both lateral sulci. Three internal, or vaginal, and two external, or perineal, sutures in place ready to be tied. (Copper-plated plaster cast; from a photograph.)

In order that the student shall acquire this manual training, it has been our custom to place the proper instruments in his hands and require him to carry out the procedures above referred to. His handling of the curette is then criticised; the model is opened and the

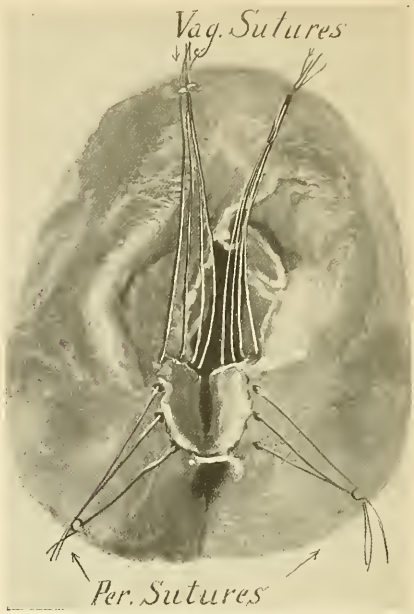


FIG. 67.—Vagino-perineal laceration involving right postero-lateral vaginal wall and perineum to the sphincter ani. Four internal, or vaginal, and three external, or perineal, sutures in place ready to be tied. (Copper-plated plaster cast; from a photograph.)

manner of the gauze packing inspected, and if he has failed to reach the fundus with the gauze, his fault explained to him. So also the ligature in the cervical laceration is looked to, and the student's errors in technic corrected.

I have intended in this model to supply to the student the means and the opportunity to acquire that kind of manual training in certain obstetric procedures which may never occur to him until he is in active practice, and, moreover, the manual training that will save the physician's first cases of confinement much that would otherwise be but crude and experimental, if not actually dangerous, treatment.

Fig. 7 represents the use of the leather uterus in a manikin. The uterus, drawn down into the vulva by means of two volsella forceps, and is held by an assistant; with blunt-pointed dressing forceps the student proceeds to pack the uterus with gauze from a glass receptacle, the fingers and palm of the left hand being used as a trough to guide the gauze directly from the glass tube into the uterine cavity, thus avoiding all contact with adjacent unclean tissues.

Fig. 8 illustrates the uterus drawn down in the

same manner, and the student with needle and holder applying a ligature to a bleeding lacerated cervix.

Fig. 68.—Laceration of right postero-lateral vaginal wall, perinæum, and anterior rectal wall through the sphincter. Four rectal sutures and one silver wire suture, the latter transfixing torn ends of sphincter muscle and encircling apex of rectal laceration, in place and ready to be tied. (Copper-plated plaster cast; from a photograph.)

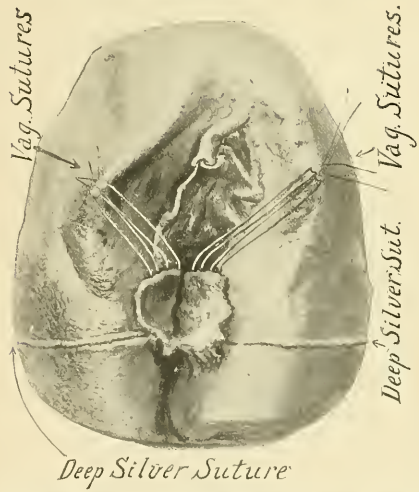


Fig. 69.—Rectal sutures of Fig. 68 tied and cut short in rectum. Silver-wire sphincter suture and four vaginal sutures in place and ready to be tied. (Copper-plated plaster cast; from a photograph.)

4. *Rubber Perinæum and Vulva.*—In Fig. 63 is shown a rubber pelvic floor taken from Nature. A plaster cast in this model was first taken from the living subject, this in turn cast in iron, and from this latter rubber

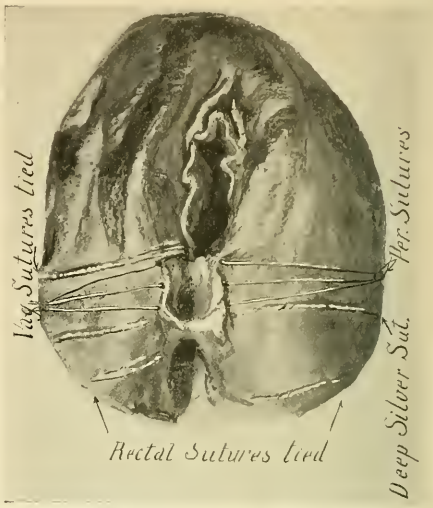


Fig. 70.—Vaginal sutures of Fig. 69 tied. Three perineal sutures in place, ready to be tied. (Copper-plated plaster cast; from a photograph.)

models were made. It supplies the place of the ordinary manikin for class-room, clinic, or ward demonstration,

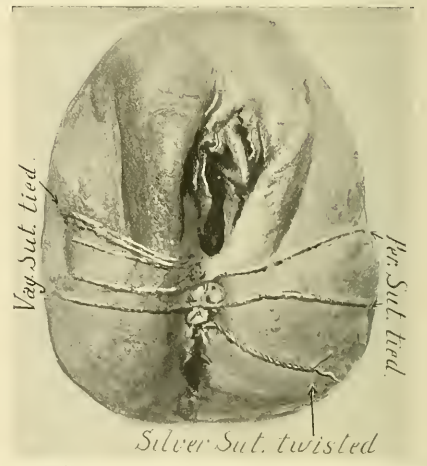


Fig. 71.—Perineal sutures of Fig. 70 tied. Ends of deep silver suture transfixing sphincter muscle twisted. Ends of rectal sutures hidden by closed anus. Vaginal sutures seen to the right. (Copper-plated plaster cast; from a photograph.)

and has the additional advantage of being readily portable and capable of being kept perfectly clean.

V. *Electro-plated Plaster Models.*

Experience has taught us that the *papier-maché* method is not applicable for very small objects where minuteness of detail is required. I refer more particularly to the non-pregnant uterus, the pregnant uterus in the early months, conditions of the cervix, lacerations of the vagina and pelvic floor. We have therefore hit upon a method of illustration which has given the greatest satisfaction, and secures for us a model which is comparatively light, practically indestructible, and leaves nothing to be desired in accuracy of detail, as the original and permanent model is a plaster cast taken from Nature.

If, for example, a reproduction of the multiparous uterus is desired, as soon as possible after its removal from the cadaver a model in plaster of Paris is taken of it. From this model, subsequently, any number of casts or models may be reproduced. These are allowed to dry thoroughly, and are then sent to an electrotyper, who, at a trifling expense, throws a layer of copper over the plaster cast, and afterward the model can be colored in any desired manner. In this way were obtained the smaller uteri represented in Figs. 10 and 11, and the several degrees and varieties of perineal lacerations artificially produced upon the cadaver and represented in Figs. 64 to 71.

We need not confine ourselves to plaster as regards copper-plating, as bone, composition, and clay may be subjected to the same process. All the models of pelvic deformity (groups 1 to 24) were treated in the same way for the sake of strength and durability.

1. *Lacerations of Vagina, Perinæum, and Anterior Rectal Wall.*—My aim in this direction has been to produce a series of models that shall illustrate the ordinary degrees of vaginal, perineal, and rectal lacerations produced during childbirth. To this end at first I confined myself to plaster casts taken from the living subject at the completion of the puerperium. This proved unsatisfactory, however, because of contraction and distortion of the parts in question, so that the series herein offered represents plaster casts of artificially produced lacerations with the knife upon the cadaver. The positive mold being taken in plaster of the injury produced, a second positive in glue was taken from this, and then negative plaster casts taken from the glue positive and copper-plated. These latter are then completed by the insertion of sutures by means of an ordinary drill.

This series includes (1) a cast of the nulliparous genitals, showing the fourchette, from which the subsequent casts, with injuries, were secured (Fig. 64); (2) a vagino-perineal laceration involving the right lateral vaginal sulcus, with sutures for repair in position (Fig. 65); (3) vagino-perineal laceration, involving both lateral sulci, with sutures for repair in position (Fig. 66); (4) vagino-perineal laceration, involving right postero-lateral vaginal wall and perinæum to the sphincter ani, with sutures for repair in position (Fig. 67); (5) laceration of right postero-lateral vaginal wall, perinæum, and anterior rectal wall through the sphincter, sutures for repair of rectal wall, and suture, including sphincter, in place (Fig. 68); (6) rectal sutures tied and cut short, wire sphincter suture ready to be tied, vaginal sutures in position (Fig. 69); (7) vaginal sutures tied, external perineal sutures in position (Fig. 70); (8) external perineal sutures tied (Fig. 71).

2. *Pelvic Deformity.*—The subject of pelvic deformity has always been one of the dryest and most uninteresting to the student, and one of the most difficult for the instructor to teach. Little more than a temporary impression is made by diagrams, verbal and printed descriptions, and by perhaps an occasional clinical demonstration of some form of pelvic deformity, so that at graduation, and even later in the pupil's professional career, the various deformities, whether they be congenital or produced by rhachitis, osteomalacia, ankylosis, or adventitious causes, too often escape notice until the patient is perhaps well in the first stage of labor. We have always believed that the best, if not the only satisfactory method for the pupil to acquire an intelligent appreciation of this subject is to place in his hands the various deformed pelves, and with the normal type in view before him require the student to point out the departures from the normal in the deformed pelvis. This can readily be made a stepping-stone to the causes of such abnormities, the diagnosis and prognosis of the same, and the treatment appropriate to meeting the condition in pregnancy or labor. Commencing with the moderate deformities, the more marked and rarer conditions can then be gradually approached. So in the obstetric clinic, hospital ward, or the dispensary, examination of pregnancy, varieties of pelvic deformity, with their prognosis and treatment, can be brought home to pupils in a manner never before thought possible, if at our command we possess a series of deformed pelves from which one resembling, if not exactly corresponding to, the abnormity can be chosen. Heretofore this want we have been unable to meet in the recitation room or hospital. The limited number of specimens of pelvic deformity to be found in any single college or hospital museum are practically non-accessible to the student or practitioner, and surely are too valuable and fragile to allow of repeated handling and study.

Recently Tramond,* of Paris, has completed a series of twenty-two deformed pelves.

This collection consists of twenty-two plaster models, with artificial ligaments added, being correct reproductions of the originals now in possession of private individuals or of the museums of Paris.

The series offers examples of the principal malformations, and there are in addition two pelves of normal conformation—namely, the male and female types, making twenty-four models in all.

* Maison Vasseur, 9 rue de l'École de Médecine.

In a number of the titles of the pelves herein given is included the owner of the original or the museum where found. Such a collection has been of great help to us for several years past, and had we not hit upon some means to render the models more durable, would not at the present writing be presentable. To meet the wear and tear of repeated handling and demonstration, we have had these pelves sent to an electrotyper and a thin film of copper thrown over them. This copper-plating does not, to any extent, change the proportions of the original pelves, but renders them practically indestructible, and a coat of paint will easily restore the original natural appearance. Very slight additional weight is added, and the plated model can be cleansed and thus rendered free from suspicion for clinical or bedside demonstration.

Believing this series of deformed pelves to be of value not only to the teacher of obstetrics but to the general practitioner and surgeon as well, I have made it a basis of study, making complete measurements of each pelvis, offering a photograph of the pelvic inlet and outlet of each, an outline of a lead cast to show the vertical mesial section, with the lumbo-sacro-coccygeal curve, the inclination and shape of the symphysis, and the relations of the anatomical, obstetric, and diagonal diameters of the pelvic inlet, and also the sacro- and coccygo-pubic diameters of the outlet.

Of the three conjugates appearing in each vertical mesial section, I have emphasized the obstetric by drawing here a heavier line, and it is well to state at this point that we define the obstetric conjugate as the available antero-posterior diameter of the pelvic inlet.

DISCUSSION OF THE PAPER,

"AIDS IN OBSTETRIC TEACHING," BY THE AMERICAN GYNÆCOLOGICAL SOCIETY,

New York, May 26, 1896.

Dr. A. H. Buckmaster, of Charlottesville, Va.—I wish to express my admiration of these beautiful casts, and also to call attention to a practical method of reproducing casts from the living as well as the dead subject. It is by the use of paraffin, and I think that it has some advantages over the method which the doctor described. The method is not original with myself, but was used in 1880 or 1881 by Dr. Tetamore, of Long Island College, for making some beautiful casts of the brain. It is a very simple one. The paraffin can be applied with a fine camel's-hair brush, and when carefully used it causes the patient but slight pain. When a sufficient amount of paraffin has been used it is removed, and at a later period is backed with plaster. Into this paraffin cast the plaster is run, and you have a perfect reproduction of the condition. The decussation of the pyramids can be perfectly shown by this method. I made some casts four or five years ago just before operation, and then made casts at a later period in order to show the results of restoration of the pelvic floor. I think that this method has some advantages over that described in the paper. I would like to urge its adoption generally.

Dr. Robert A. Murray, of New York.—We have all been intensely interested by Dr. Edgar's casts of the pelvis, and also those of the child which is to go through the pelvis. When I was connected with the University Medical College, and gave cases to the third-course students to deliver, it seemed to me that the important points were two: 1, the size of the pelvis; 2, the size of the child. Now, if you will notice the statistics in Germany, you will find that the average weight of the child is about six pounds and a half. In New York, with the more perfect nutrition of the child, due to the better nutrition of the mother, and in all our States, the child is usually larger than in Germany, Italy, and France. That is, it is ordinarily not six pounds, or six and a half, but seven pounds and a half. Now, we do not have in New York, nor in Chicago, nor in any of the cities of the Union, the deformed pelvis that we ordinarily see in the Italians, in the Germans, and in the French, who come here. Why? Because our people have had more perfect nutrition. They have not had to work when the pelvis was imperfectly formed. They have had sufficient nutrition, and nutrition of a kind to develop the pelvis. So that we have not the pelvis which is deformed absolutely, but one which is small relatively to the child which is to pass through it. It becomes a question of mechanics, whether the child can pass through the pelvis. We have very seldom a cordiform pelvis, seldom a Roberts's pelvis. We do not have a pelvis in which the coccyx turns up at the outlet, with marked contraction at the ou. , and in which laceration of the perinæum through the sphincter is likely to take place.

If, then, the student of midwifery would have absolute knowledge of his case, he must have knowledge of the child which is to pass through the pelvis, as well as of the characteristics of that pelvis. Now, how are we to determine that relationship between pelvis and fœtus? The student may study these casts. He may learn to do version. He may learn how to apply forceps. He may learn the different characteristics of the pelvis, and I must congratulate Dr. Edgar on the very happy way in which he makes those different deformities of the pelvis evident to the student. Ordinarily the student only knows that the male pelvis differs from the female. But here we have it shown absolutely, so that the student knows about the male and female pelvis, about the pelvis which is contracted at the inferior strait, the spondylolisthetic pelvis, etc. And until there is a diameter reduced below two inches and three quarters he does not abandon the hope of delivering through the natural channel. He also learns to determine what is the size of the child's head as he feels it above the pubes. He then knows whether he has to do a symphyseotomy, a Cæsarean section, or, if he introduces forceps and extracts the child, whether he will be likely to save it. He knows all that, and that is why I congratulate my friend Dr. Edgar for demonstrating these things to students before they have had the opportunity to examine and estimate the size of the pelvis during the state of pregnancy.

Dr. A. F. A. King, of Washington, D. C.—In the evolution and development of any science, and in the teaching of any art, new necessities are constantly arising. Now the necessity has arisen in the teaching of obstetrics, in the absence of clinical teaching, to furnish

a substitute. It is very fortunate that when these necessities arise there also occasionally appears a man of originality and intelligence to grapple with the new necessity and to provide the means of overcoming it. Dr. Edgar, with his intelligence and originality, has arisen in this country to furnish a substitute for the necessity of clinical teaching, and he has done it, or has begun it at least, in a most admirable manner. I think that we are all extremely grateful to him for the advance he has made in this substitute for clinical teaching.

Now, I have only one or two ideas to suggest. One is that in the absence of bedside teaching, which after all is the only real method of teaching obstetrics, this substitution of models is the best that we can do. It is of the greatest importance that the student's fingers should be educated, and, if Dr. Edgar would exercise his ingenuity, I think that he might devise a model which every student should buy—just as he now buys a pelvis or a skeleton to learn anatomy—a device containing a model of the fœtal head susceptible of being moved around in every direction, having the exact anatomical construction of the fœtal head. This the student may carry with him to his room, and educate his fingers, just as he would educate his muscles with dumb-bells every morning, so that he will become absolutely familiar with the sutures, fontanelles, and general anatomical structures of the fœtal head.

Another idea which would suggest itself has occurred to me for many years. I do not know whether it is practical or not, but in a large lecture room, like those in one of the schools here in New York, where seven or eight hundred matriculants are collected in a large amphitheatre, how little they can see in a case of labor, or by a small model, like Dr. Edgar's! If Dr. Edgar would exercise his originality and ingenuity he might devise a very large pelvis, eight or ten times as big as this one, and then hire a newsboy, eight or ten years old, anoint him with vaseline, have the pelvis elastic so as to avoid the danger of strangling him, and demonstrate before these enormous classes the mechanism of labor.

There is one other suggestion. It is a lamentable fact that while most universities are so richly endowed in most of their departments, in nearly all these institutions the medical school is the very last department to receive endowments. Now, it is a curious thing that while hundreds of thousands of dollars are given many universities to build laboratories, gymnasiums, dormitories, and nearly everything else, it is very seldom that we get a donation for a medical institution. In New York there are exceptions, as the Sloane Maternity, and some others, but most universities have no provision of this sort. I wish that this society could make itself heard through this country in impressing the necessity for raising money to establish maternity hospitals for teaching obstetrics. Until we accomplish this of course we can never compete with the great schools of Europe —in Vienna, in Dublin, and other cities—where actual clinical material is provided, and which is really the only proper method of teaching next to the use of Dr. Edgar's admirable models and manikins.

Dr. Edward Reynolds, of Boston.—I have known for some years that Dr. Edgar was doing pioneer work for all of us in this direction, and I have been extremely interested to see his collection of models. There is not much that one can say in the discussion of such a paper, but I sincerely hope that Dr. Edgar is going to elaborate his system of models in the direction of providing students with more and more exact exhibitions of the mechanism of labor.

I believe that in obstetrics it is peculiarly important to graduate students with a clear and definite, even though limited, set of ideas; that in the emergencies which test the results of our obstetric teaching it is far better for them to meet their cases with a concise and definite knowledge of one method of dealing with the emergency, rather than to be taught the pros and cons and wherefores without end. I believe that in order to fit men to deal with abnormal labor promptly and efficiently, a large portion of the time devoted to obstetrics must be given to careful drill in the mechanism which underlies the whole subject, and without which there is no possibility of its proper comprehension. Dr. Edgar is showing us the way to teach students the mechanism of labor, for I believe with him most heartily that there is no possibility of teaching subjects of three dimensions clearly by the use of plates of two dimensions, or by mere words. We must have models in three dimensions, and I for one look forward to Dr. Edgar's future work as likely to furnish us all with an easy means of good teaching, which we have not to-day.

Dr. Edward P. Davis, of Philadelphia.—Dr. Edgar seems to me to have represented better than has been done abroad some work which has been done by others, and then to have added several distinct and purely original and most meritorious things. The leather uterus reminds me of the rubber uterus of Winckel, by which the palpation of the fœtal cadaver can be in a measure learned. With wax casts we are more or less familiar, but to my mind the best things that Dr. Edgar has given us are this tripod with its aluminum half-pelvis, and also his method of plaster illustration of lacerations of the parturient tract.

If I mistake not, Dr. Edgar has not done himself full justice in the idea of the tripod, as he uses, I think, a pelvis of metal and a tripod in which he places the fœtus in the position of normal labor when illustrating his lectures, so that this is but a part of his work in that line.

These illustrated lacerations are certainly better than any which have before come under my observation. They represent in a clean and exact way an actual reproduction of the lesion and the method of treatment.

Referring to what has been said of the value of education in three dimensions, there is certainly no better way of teaching the mechanism of labor than by giving to each student a pelvis and head with normal dimensions, and educating his finger to recognize the relative proportion of the one to the other. When thrown upon his own resources he may be without the means of accurate measurement, but the finger which recognizes the fact that the head does not engage in the pelvis is the safe finger for obstetric practice, and that can be taught by placing the normal head in a model of a pelvis sufficiently deformed to prevent engagement of the head. That is one thing which the student must know, or he will apply forceps to the disaster of the mother and child.

There remains a way for further advancement in illustrating obstetrics in a most interesting direction—namely, that of the Roentgen rays for photographing, or skiagraphing, the living pelvis and uterus. The time of exposure now necessary has been reduced to about one minute, but the one element which has baffled us

in obstetrics is the fact that the fœtus is in almost constant motion, and it has so far been impossible to clearly skiagraph the living fœtus. When the time of exposure shall be so reduced that the fœtal movements shall offer no serious obstacle we may hope that Dr. Edgar will supplement his admirable work with skiagraphy.

Dr. Edgar.—There is very little left to say. With regard to Dr. Buckmaster's remarks, I would imagine that paraffin would do very well, but in my hands it has not given the same success as plaster. Plaster has certainly taken in all the depressions and elevations in a satisfactory manner, as is shown by the casts of the vaginal and perineal lacerations.

In reply to Dr. Murray, I do not know whether he misunderstood the paper, but I did not at all mean to imply that the models and methods referred to were to take the place of clinical instruction. They were only to act as adjuncts and aids to such instruction.

I want to thank Dr. King for his kind words, and I would like to repeat to him that all this paraphernalia is meant to be used in maternity hospitals as well as in the lecture room. I might say that there are two periods in the student's career when these adjuncts come into play: during the second year, when he is preparing for obstetric work, and later, when he is in the maternity service and is seeing cases of confinement, in order to illustrate more graphically parts out of sight In reply to Dr. King's suggestion, I would say that I have such a pelvis, which is three times the size of this one (normal pelvis), but I could not get it into the cab, consequently it remains at the foundry. I have not yet secured the newsboy, but Mr. Reynders is preparing a puppet which is exactly three times the size of one of these which you see—*i. e.*, three times the normal size.

Again, in connection with Dr. King's remarks, I would like to say that we do have an abundance of clinical teaching here in New York; that the students from all the principal medical schools are required now to take a two weeks' course and to confine a number of patients. They take it in the most practical way imaginable; that is, they actually confine the women. They live in the hospital, and during the intervals between the confinements they attend the operations or clinics going on in the institution.

I would like to have referred further to the mechanism of labor, as Dr. Reynolds has suggested, but the time was so limited that I was unable to do so. The primary idea was to show the posture of the child, internal rotation, extension, and flexion; that is, to give an ocular demonstration of the mechanism of labor. Some of the remarks I was compelled to leave out (they will appear in the published paper) which apply more particularly to the mechanism of labor.

I wish to thank Dr. Davis for his kind words. I did not refer to the full model of the pelvis, which he spoke of, because it had already been presented to the New York Obstetrical Society. The tripod is interchangeable.

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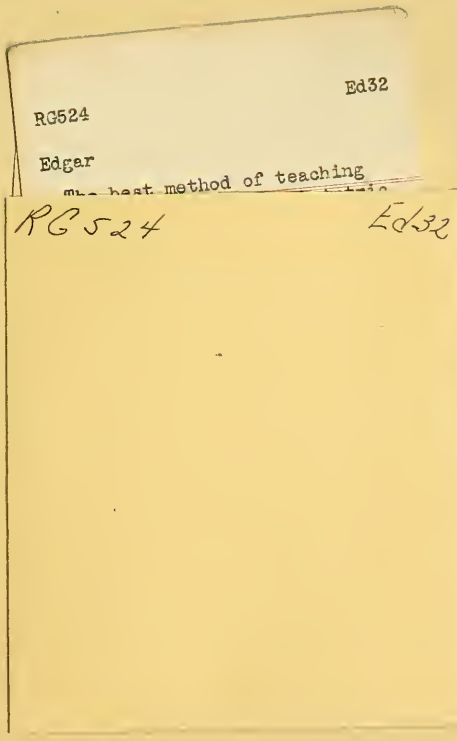
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